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XLVI.—CROWN-GALL.

(*Dendrophagus globosus*, Toumey.)

G. Massee.

(With Plate.)

The presence of galls or tumours on the roots of plants of various kinds has frequently been recorded both in this country and on the Continent, more especially on vine roots. These outgrowths have been investigated from time to time, and various organisms, such as fungi, myxogastres, bacteria, have been observed in the tissues, but in no instance has the pathogenesis of any of these organisms been clearly demonstrated. The generally accepted opinion has been that the primary cause of such galls is due to wounds, frost, or to some other physiological disturbance.

During the past season, examples of plum, rose, raspberry, loganberry, and chrysanthemum plants have been received at Kew for investigation, each bearing irregularly globose, nodulose swellings, originating from the collar region of the stem. In the raspberry small nodules were also present on the branches of the root. Most of the galls were woody and dead, and showed no indication of the cause of their origin. Mycelium and spores of various fungi were met with in the broken-down tissues, but nothing that suggested, from analogy, any organism capable of inducing the formation of a gall. It was not until specimens of the Paris daisy (*Chrysanthemum frutescens*, L.), bearing large excrescences at the base of the stem, were examined, that the true nature of the gall was determined. This proved to be the well-known and very destructive disease called "Crown-gall." Such galls are believed to be caused by *Dendrophagus globosus*, Toumey, one of the Myxogastres or Mycetozoa, allied to *Plasmodiophora brassicae*, Woronin, the cause of "finger-and-toe" or "anbury" on the roots of many cruciferous plants.

When a section of a gall in a soft and succulent condition is examined under the microscope, strands of plasmodium are seen permeating the tissues in every direction. In certain cells the plasmodium appears as a reticulated vacuolate mass, and is often rather coarsely granular. When treated with Flemming's solution,

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or with 1 per cent. osmic acid, the plasmodium gradually blackens, and in a rather thick section the distribution of the parasite in the tissue can be readily seen. A similar effect, although not so strongly emphasised, is produced when a section is treated with a solution of iodine. It is somewhat remarkable that during the active or vegetative period of the plasmodium there is not a trace of starch present in the tissues of the gall. In connection with this, and perhaps as an explanation, Toumey remarks that repeated tests show that the gall tissue contains a much larger quantity of an oxidizing enzyme than the normal tissue. Toumey, who first discovered *Dendrophagus*, has given a detailed account of its development, accompanied by figures, and among other points states that when a section of a gall containing plasmodium is placed under proper conditions, amoeboid bodies separate from the plasmodium in the course of two or three days.

In the English specimens I observed that if a gall containing plasmodium is cut off and allowed to become dry, the plasmodium concentrates into compact masses and appears to pass into a resting condition. If sections are now cut and placed in slightly warm water, the resting masses of plasmodium gradually expand and assume the motile or streaming state. Eventually the plasmodium concentrates in the peripheral cells of the gall and from thence passes to its free surface, where it becomes resolved into numerous minute, globose sporangia of a reddish-yellow colour and about 1 mm. diameter. The sporangia contain numerous minute orange-yellow spores, 1·5 to 3 μ in diameter. Traces of a capillitium are also present, mixed with the spores. Toumey has obtained the fruit on several occasions on galls from different districts.

Crown-gall is considered a very serious disease in the United States. Many thousands of fruit trees have been killed by it when growing under the most favourable conditions. The subject has been very carefully worked out by Toumey, who has met with the galls on the following trees : peach, apricot, almond, prune, plum, apple, cherry, poplar, chestnut, raspberry, and blackberry. He has proved that the disease is of a contagious nature. Healthy seedlings planted in soil mixed with sliced galls contracted the disease, as did also healthy trees planted in proximity to diseased ones.

In addition to the above experiments, which, although strongly suggestive of the myxogaster being the primary cause of the gall formation, do not absolutely prove the point, Toumey made inoculations at the crown of one-year-old almond seedlings, using spores of *Dendrophagus*, and in due course galls developed at the point of inoculation.

Seedlings are most susceptible to the disease. The galls appear in the region of the collar or on the larger roots and commence growth as very minute, smooth, colourless, wart-like bodies, often attached to the stem by a narrow neck. Growth is rapid, and the surface of the gall soon becomes nodulose or warted, and darkens in colour. The galls usually decay at the end of one season's growth, and leave an open wound which penetrates for some distance into the wood. The following season gall formation commences round the margin of the wound formed the previous season. These galls

perish in turn, and the process is repeated each season, resulting in a large, deep wound. When two or three such wounds are present on different sides of the stem, its stability is much diminished, and it frequently breaks at the injured part.

We have at present no direct knowledge as to the relative frequency of crown-gall in this country. The galls are usually formed just under ground, or on the root, and so escape observation, and those galls that have been noted from time to time have had their origin attributed to other than the true cause. Judging from the literature pertaining to plant diseases, galls answering to the description of crown-gall, are by no means uncommon in every country where fruit trees are grown.

According to Toumey, crown-gall is most destructive to nursery stock, as the disease spreads rapidly along the rows, killing a large number of seedlings outright. The widespread dissemination of the disease in the United States is attributed to the wholesale distribution of infected stock from nurseries, also to negligence in the disposal of diseased material. When older trees become infected the galls may continue to be produced for many years, the tree living on, but making less growth and producing a smaller quantity of fruit, and of an inferior quality to that of a healthy tree. Under such circumstances it is false economy to allow such a tree to remain standing.

It is estimated that $1,000,000, possibly much more, is lost annually in the fruit-growing districts of the United States through this disease.

When trees are not badly diseased, Toumey found that by cutting away the galls, and covering the wounds with a paste composed of two parts sulphate of copper, one part sulphate of iron, and three parts of quick-lime, the further development of the galls was arrested. On the other hand, it is considered that in the end the most economical course is to remove and burn all trees that are at all badly infected, as such constitute centres of infection from which the disease spreads to neighbouring trees ; such trees, although they may continue to live and bear a certain amount of fruit for many years, should not be allowed to monopolise the space that could be more profitably occupied by a healthy tree.

Quick-lime should be worked into the soil in orchards known to be infected. Finally, nursery stock should be critically examined before it is planted.

Following on Toumey's investigations, Erwin F. Smith and E. O. Townsend have devoted a considerable amount of time and attention to the origin and cause of crown-gall, and have come to the conclusion that a bacterium is the primary cause of these outgrowths, and furthermore that *Bacterium tumefaciens*, the cause of the mischief, is a new species. According to these authorities Toumey's myxogaster is a secondary agent. One thing seems fairly certain, the galls investigated by the different authors mentioned are identical in origin. It is further certain that crown-gall, as met with in England, has exhibited Toumey's *Dendrophagus*, whereas no trace has yet been found of *Bacillus tumefaciens*, as described by Smith and Townsend, in "Centralbl. f. Bakt. Parasit. u. Infektionskr," 20, p. 89 (1907).

From an economic standpoint the fact that crown-gall is due to a living organism enables a definite scheme for its prevention to be formulated, and the fact of its being contagious—which is admitted by all who have investigated the subject—should lead to measures for the prevention of its wholesale dispersion, on the part of both nurserymen and fruit growers.

Explanation of Plate.

1.—Crown-gall in fresh condition on the root of *Chrysanthemum frutescens*, L., the Paris daisy.

2.—An exolete or woody condition of crown-gall on the root of a cultivated rose tree. Both figures half natural size.

XLVII.—NEW LAURACEAE FROM THE MALAYAN REGION: III.

J. S. Gamble.

Actinodaphne montana, *Gamble* [Lauraceae-Litseeae]; species *A. angustifoliae*, Nees, affinis et forsitan ejus varietas sed folia nervis supra haud prominentibus et perianthii tubus fructifer multo longior.

Arbor ad 15–20 m. alta et 30–45 cm. trunci diametro; ramuli fusci, glabri, striati; perulae ovatae, acuminatae, apicibus recurvis. *Folia* chartacea, 4–5 in verticillis ad nodos, incrassata, lanceolata vel oblanceolata, apice longe acuminata, basi acuminata, utrinque glabra et infra siccitate glauca; 15–25 cm. longa, 4–8 cm. lata; costa prominens; nervi utrinque 8–10 obliqui, marginem versus curvati et ibi gradatim arcuati; nervuli transversi conspicui, arcuati, reticulatione conspicua; petiolus gracilis, 1–3 cm. longus, sulcatus. *Flores* ignoti, in umbellulis in racemis pubescentibus 2 cm. longis ex internodiis verticillorum. *Drupa* (immatura) in perianthii tubo incrassato cyathiformi pedicello aequilongo insidens; matura nondum visa.

Malay Peninsula. Perak: mountain tops near Larut, 900–1100 m., *King's Collector*, 2129, 2913.

Actinodaphne Ridleyi, *Gamble* [Lauraceae - Litseeae]; species *A. malaccensi*, Hook. f., affinis, foliis angustioribus nervis paucioribus, floribus minus congestis et perianthii lobis longioribus differt.

Arbor ?; ramuli teretes, juniores ferrugineo-pubescentes. *Folia* chartaceo-coriacea, 4–6 in verticillis, lanceolata, apice acuminata et mucronata, basi acuminata; supra lucida, glabra, areolata, infra fusco-villosa, ad costam et nervos pubescentia, marginibus paullo recurvis; 10–16 cm. longa, 3–5 cm. lata; costa gracilis, utrinque prominens; nervi utrinque 6–8, ad marginem curvati et ibi gradatim minus arcuati; nervuli transversi recti, sicut reticulatio obscuri; petiolus mediocre crassus, ferrugineo-pubescens, 1–2 cm. longus. *Flores* in umbellulis sessilibus axillaribus vel lateralibus perulis paleaceis deciduis suffultis; bracteae involucrales orbiculares, deciduae; flores in umbellulis circa 4; perianthii tubus 2·5 mm.

longus, lobi obovati, obtusi, 3·5 mm. longi, extus dense villosi, intus glabri. *Stamina* florum ♂ ignota; staminodia florum ♀ 9, ordinum I et II lineari-clavata, 1·5 mm. longa, filamentis villosis, ordinis III similia, glandulis 2 magnis glabris subreniformibus paullo supra basin filamenti. *Ovarium* obovoideum, apice hirsutum, stylo gracili curvato, stigmate parvo trilobo. *Drupa* globosa, 1 cm. diametro, supra perianthii tubum incrassatum lobis et staminodiis persistentibus insidens; pericarpium glabrum, lucidum.

Malay Peninsula. Johor: at Gunong Pulai, *Ridley*, 12,165.

Borneo. *Haviland.*

Actinodaphne johorensis, *Gamble* [Lauraceae-Litseeae]; species *A. malaccensi*, Hook. f., affinis, foliis lanceolatis angustioribus coriaceis infra glaucis, nervis paucioribus, etiam drupa et perianthii tubo incrassato majoribus differt.

Arbor ?; ramuli teretes, glabri, juniores paullo rufo-villosi. *Folia* coriacea, 3–5 in verticillis, anguste lanceolata, apice obtusa, basi longe cuneata, utrinque glabra, supra lucida, siccitate olivaceo-viridia, infra glauco-grisea; 12–16 cm. longa, 3–5 cm. lata; costa gracilis utrinque prominens; nervi distantes, utrinque 6–7, obliqui, prope marginem arcuatim inter se juncti; nervi secundarii pauci; nervuli transversi cum reticulatione areolata perobscuri; petiolus 2–3 cm. longus, sulcatus. *Flores* haud noti, in umbellulis ut videtur ad verticillorum internodia. *Drupa* globosa, 1·2 cm. diametro, supra perianthii tubum incrassatum complanatum 7 mm. diametro insidens, pedicello crasso 8 mm. longo; pericarpium opacum, siccitate nigrum.

Malay Peninsula. Johor: at Gunong Panti, 300 m., *Ridley*, 4419.

Actinodaphne oleifolia, *Gamble* [Lauraceae-Litseeae]; species *A. stenophyllae*, Thwaites, insulae zeylanicae incolae peraffinis, foliis infra glabris nec ad nervos ferrugineo-pubescentibus, pedunculis brevioribus et perianthii lobis persistentibus differt.

Arbor parva vel frutex vix 2–3 m. alta; ramuli graciles, teretes, pallide griseo-fulvi, juniores molliter ferrugineo-villosi sicut etiam inflorescentia. *Folia* coriacea, 4–8 in verticillis, elliptico-oblonga vel lanceolata, apice obtusa, basi breviter attenuata, glabra, supra lucida, infra glauca; 5–11 cm. longa, 2–3 cm. lata; costa crassa rufescens; nervi utrinque 8–10 vel plures, supra prominentes, ad marginem curvati; nervuli transversi arcuati; reticulatio prominenter areolata; petiolus ruber, gracilis, 1–2 cm. longus. *Flores* in umbellularum fasciculis densis cymosis ex verticillorum axillis vel ex internodiis; bracteae orbiculares, deciduae; flores in umbellulis 5; bracteae involucrales 5–6, concavae, imbricatae; perianthii lobi ovati, extus dense villosi, intus glabri, 3 interiores paullo minores, 2–3 mm. longi. *Stamina* florum ♂ filamentis villosis, ordinum I et II brevia, ordinis III glandulis 2 reniformibus sessilibus; staminodia florum ♀ villosa, ordinum I et II spathulata, ordinis III hastata glandulis 2 magnis glabris munita. *Ovarium* in floribus ♂ rudimentarium, stylo gracili, stigmate capitato; in floribus ♀ ignotum. *Drupa* ovoideo-oblongo, 7–12 mm. longa, 4–7 mm. lata, supra peranthii tubum incrassatum cupuliformem et lobos persistentes

insidens ; pedicelli 5 mm. longi, villosi ; pericarpium laeve, stylo persistente.

Malay Peninsula. Perak: at Gunong Batu Pateh, 1470 m., *Wray*, 280 ; at Gunong Iras, 1500 m. *Wray*, 4111 ; in open forest, 1500–1600 m., *King's Collector*, 7347 ; at 1500 m., *Scortechini*, 350. Pahang : at Gunong Berimbu, *Ridley*, 13,728 ; at Kluang Terbang, *W. D. Barnes*.

Borneo. Sarawak : near Kuching, *Haviland and Hose*, 364 (folia longiora et minus prominenter areolata).

Actinodaphne Hullettii, *Gamble* [Lauraceae-Litseeae] ; species *A. oleifoliae*, Gamble, affinis, foliis acuminatis infra molliter griseo-fulvo-pubescentibus vel glaucis et reticulatione obscura differt.

Arbor ; ramuli graciles griseo-fulvi, juniores ferrugineo-pubescentes. *Folia* coriacea, 3–5 in verticillis, oblanceolata, apice acuminata, basi cuneata ; supra lucida, praeter costam glabra, infra molliter griseo-fulvo-pubescentia ; 7–11 cm. longa, 2–3 cm. lata ; costa gracilis prominens, ferrugineo-pubescens ; nervi utrinque 5–6, perobliqui, ramosi ; nervuli transversi pauci, in foliis vetustioribus solum visibiles ; reticulatio etiam haud visibilis ; petiolus 0·5–1 cm. longus, ferrugineo-pubescens. *Flores* in umbellularum fasciculis bracteatis axillaribus vel lateralibus ; bracteae deciduae ; pedunculus brevis crassissimus ; ♂ cum pedicellis 2–3 mm. longis ; perianthii tubus brevis, villosus, lobi ovati, ciliati, extus pubescentes, intus glabri, 2·5 mm. longi. *Stamina* florum ♂ filamentis villosis, ordinum I et II breviter oblonga, ordinis III breviora, glandulis 2 magnis reniformibus prope basin. *Ovarium* florum ♂ rudimentarium, ovoideum, stylo brevi. *Drupa* cum florum ♀ staminodiis et ovario ignota.

Malay Peninsula. Singapore : in Botanic Garden (wild ?), *Hullett*, 659.

Actinodaphne cuspidata, *Gamble* [Lauraceae-Litseeae] ; species *A. borneensi*, Meissn., affinis, foliis cuspidatis nervis pluribus differt.

Arbor ad 12–18 m. alta et 20–30 cm. trunci diametro ; ramuli crassiores, cortice griseo vel flavescenti, juniores ferrugineo-pubescentes. *Folia* subcoriacea, circa 4 in verticillis, elliptica vel elliptico-obovata, apice longe cuspidato-acuminata acumine acutissimo, basi attenuata ; supra glabra lucida, subtus glauca, pilis sparsis nigris munita, ad costam et nervos ferrugineo-pubescentia ; 8–12 cm. longa, 4–5 cm. lata ; costa conspicua, prominens ; nervi utrinque 8–10, irregulares, curvati et ad marginem arcuatim juncti ; nervuli transversi sub-horizontales, reticulatione obscura ; petiolus gracilis ferrugineo-pubescens, 1 cm. longus. *Flores* in umbellulis in racemis brevissimis ferrugineo-pubescentibus vix 1 cm. longis subterminalibus vel lateralibus ex verticillorum internodiis, basi perulis castaneis caducis suffultis ; pedunculi brevissimi ; bracteae involucrales 4, ovatae ; flores in umbellulis 4 ; perianthii lobi ovati, obtusi, ciliati, 2·5 mm. longi. *Stamina* florum ♂ 9, ordinum I et II 2 mm. longa, antheris oblongis et filamentis villosis ; ordinis III breviora glandulis 2 magnis sessilibus vel brevissime stipitatis ad basin ; florum ♀ staminodia ignota. *Ovarium* florum ♀ ignotus, florum ♂ rudimentarium stylo gracili, stigmate capitato. *Drupa* non visa.

Malay Peninsula. Perak: on hills near Ulu Bera, 150–250 m., *King's Collector*, 10,797.

Actinodaphne fragilis, *Gamble* [Lauraceae - Litseeae]; species pulchra caeteris haud affinis, foliis ovatis subtus albis et inflorescentiae ramulis fragilibus insignis.

Arbor ad 12–18 m. alta et 60 cm. trunci diametro; ramuli graciles griseo-fulvi glabri, juniores minute puberuli. *Folia* coriacea, 2–4 in verticillis, ovata vel elliptico-ovata, apice obtuse acuta, utrinque glabra, infra albo-glauca; 5–12 cm. longa, 2–5 cm. lata; costa gracilis, utrinque prominens; nervi utrinsecus 5–6, pare infimo subopposito, ad marginem curvati et ibi arcuati; nervuli transversi et reticulatio areolata obscuri; petiolus gracilis, 1–2 cm. longus, sulcatus. *Flores* in umbellulis, in umbellis gracilibus ferrugineo-pubescentibus pedunculatis ad 1 cm. longis, lateralibus in internodiis ramulorum ultimorum, siccitate fragilibus; bracteae involucrales cito deciduae; pedicelli graciles, 2 mm. longi; perianthii tubus brevis, annulo pilorum aureo-fulvorum intus ad os munitus; lobi ovati, ciliati, intus glabri, 1 mm. longi. *Stamina* florum ♂ ignota; florum ♀ staminodia minima, clavata, filamentis villosis, ordinis III glandulis 2 glabris orbicularibus. *Ovarium* globosum, stylo gracili torto stigmate magno capitato. *Drupa* ovoidea, ad 1 cm. longa, 7–8 mm. diametro, supra perianthii tubum incrassatum patelliformem 5–6 mm. diametro insidens; pericarpium laeve, lucidum, pedicello incrassato 7 mm. longo.

Malay Peninsula. Perak: Ulu Bubong; on top of hills, 180–280 m., *King's Collector*, 10,743, 10,904.

Litsea johorensis, *Gamble* [Lauraceae-Litseeae]; species cauliflora, *L. cauliflorœ*, Stapf, borneensi affinis, foliorum nervatione et umbellulis majoribus praecipue differt.

Arbor parva, cortice albo; ramuli graciles, grisei, juniores dense rufo-tomentosi. *Folia* coriacea, alterna, ad apices ramulorum paullo conferta, oblanceolata, apice acuminata, basi longe attenuata, supra fusca, costa et nervis exceptis glabra, infra parce tomentosa, purpurea, juniora rufo-purpurea; 10–30 cm. longa, 4–10 cm. lata; costa gracilis, supra impressa; nervi utrinque 10–14, supra impressi, marginem versus cito curvati; nervuli transversi irregulares, ramosi, reticulatione areolata; petiolus ex basi crasso gracilis, supra sulcatus, 1·5–2·5 cm. longus. *Flores* in umbellulis, pedunculis tomentosis 1·5 cm. longis, ex tuberculis lignosis e trunco arboris; umbellulae florum ♂ ad 1·5 cm. ♀ ad 1 cm. diametro; bracteae involucrales 4–5, orbiculares, extus tomentosae, intus glabrae; flores in umbellulis subsessiles; perianthii lobi oblongi vel spathulati, parce villosi, 5–7 mm. longi. *Stamina* florum ♂ recte 9, saepe 10, ordinum I et II ad 9 mm. longa; antheris oblongis et filamentis villosis, aliquando 1–2 glandulas parvas ferentibus; ordinis III breviora, glandulis 2 magnis reniformibus, stipitatis, filamentorum ad basin thecis magnis ellipticis; ovarium rudimentarium ovoideum, stylo crasso stigmate bifido. *Staminodia* florum ♀ recte 9, saepe ad 12, ordinum I et II linearia, villosa, ad 3 mm. longa, saepe glandulas ferentia; ordinum III et IV triangulari-acuminata, glandulis 2 magnis, 1 mm. longa. *Ovarium* ovoideum, glabrum, stylo crasso curvato; stigmate peltato. *Drupa*

(immatura) ovoidea, apice truncata, ad dimidium in perianthii tubo incrassato 6 mm. longo 1 cm. diametro inclusa ; pedicellus incrassatus, brevissimus, crassus ; pericarpium laeve.

Malay Peninsula. Johor : at Tanjong Bunga, *Ridley*, 6458 ; near Castlewood, *Ridley*, 9163 ; at Mount Austen, *Ridley*, 11,995 , at Seduah, *Ridley*, 13,479.

Litsea trunciflora, *Gamble* [Lauraceae-Litseeae] ; species cauliflora, sicut *L. cauliflora*, Stapf, et *L. johorensis*, Gamble, sed foliis majoribus differt ; etiam *Tetrantherae ? ochrascenti*, Miquel, e Sumatra (cujus flores ignoti) affinis sed foliorum nervatione differt.

Arbor ad 18 m. alta et 30–40 cm. trunci diametro, cortice laevi griseo-fulvo ; ramuli crassi pallide fusci, juniores ferrugineo-tomentosi. *Folia* chartacea, alterna, obovata vel oblanceolata, apice rotundata vel emarginata, basi longe cuneata, supra lucida praeter costam villosa, infra caerulescentia, siccitate griseo-fusca, ferrugineo-tomentosa ; 28–56 cm. longa, 11–22 cm. lata ; costa crassissima, supra impressa ; nervi utrinque 11–22, supra impressi, saepe ramosi et cum nervis etiam secundariis primo recti, prope marginem curvati et arcuati ; nervuli transversi distantes, irregulares ; reticulatio areolata ; petiolus crassissimus, 1·5–2·5 cm. longus. *Flores* in umbellulis pedunculis pubescentibus 1–1·5 cm. (♂) 7–8 mm. (♀) longis, ex tuberculis lignosis e trunco arboris ; fasciculi multiflori, circa 5 cm. diametro ; umbellulae 1–1·2 cm. diametro ; bracteae involucrales 4, orbiculares, extra pubescentes, intus glabrae ; flores in umbellulis ♂ 4–5, sessiles ; perianthii lobi 6, variabiles, saepe lineari-oblongi, sparse villosi, 5–6 mm. longi. *Stamina* florum ♂ numero variabilia, recte 9 vel 12 ; ordinum I et II 7–8 mm. longa, antheris oblongis et filamentis villosis saepe glandulas ferentibus ; ordinum III et IV breviora, glandulis 2 rotundis stipitatis filamentorum ad basin thecis magnis ellipticis saepe lateralibus ; ovarium rudimentarium ovoideum, stylo gracili curvato, stigmate peltato. *Staminodia* florum ♀ ordinum I et II lineari-clavata, 3 mm. longa, villosa, saepissime glandulas ferentia, ordinum III et IV breviora, glandulis 2 crassis. *Ovarium* ovoideum, stylo gracili recto ; stigmate peltato. *Drupa* (immatura) depresso-globosa, in perianthii tubo incrassato fere omnino inclusa.

Malay Peninsula. Perak : Goping District, 150–300 m. *King's Collector*, 4582, 8211 ; without locality, *Herb. Singap.*, 448.

Litsea artocarpifolia, *Gamble* [Lauraceae-Litseeae] ; species *L. grandi*, Hook. f., affinis, racemis longioribus, umbellulis subsessilibus foliis griseis costa complanata et aliis notis differt.

Arbor ; ramuli crassissimi, lenticellis et foliorum delapsorum cicatricibus multis notati, fusci, juniores ferrugineo-pubescentes. *Folia* coriacea, alterna, obovata, apice obtusa vel paullo apiculata, basi attenuata, supra lucida, praeter costam et nervos glabrescentia, infra ferrugineo-pubescentia ; 20–25 cm. longa, 9–12 cm. lata ; costa crassa, latissima, supra depressa ; nervi utrinque circa 20, regulares, paralleli, impressi, primo recti deinde curvati ; nervuli transversi multi, prominentes ; reticulatio obscura ; petiolus crassissimus, 1–1·5 cm. longus, supra sulcatus. *Flores* in umbellulis sessilibus vel brevipedunculatis, in racemis 4–6 cm. longis ex foliorum delapsorum axillis confertis ; umbellulae ♂ 1·5 cm. latae, bracteae involucrales 5, orbiculares, concavae ; flores in umbellulis 6 ; pedicelli crassi, villosi,

4 mm. longi; perianthii lobi 6–8 oblongo-lanceolati, sericeo-villosi, 5 mm. longi. *Stamina* florum ♂ 9–15, probabiliter recte 12; ordinum I et II 8 mm. longa, aliquando glandulas ferentia; ordinum III et IV breviora, glandulis 2 magnis reniformibus stipitatis paullo supra filamentorum basin; antherae obovatae thecis inferioribus lateralibus; ovarium rudimentarium 0. *Staminodia* florum ♀ et drupa ignota.

Malay Peninsula. Perak: at Relan Tujor, *Wray*, 2233.

Litsea gracilis, *Gamble* [Lauraceae-Litseeae]; species gracilis *L. rangoonensi*, Meissn., affinis, foliis subtus haud ferrugineo-tomentosis nervis foliorum paucioribus et floribus in fasciculis perpaucis differt.

Arbor parva; ramuli gracillimi, dense ferrugineo-pubescentes. *Folia* membranacea, alterna, oblongo-lanceolata, apice acuminata, basi attentuate acuta, supra lucida, praeter costam glabra, infra sparse villosa; 8–14 cm. longa, 2–4 cm. lata; costa gracilis supra parum impressa; nervi utrinque 8–10, e costa curvati et prope marginem gradatim arcuati; nervuli transversi irregulares ramosi; reticulatio obscura; petiolus gracilis, 4–5 mm. longus. *Flores* in umbellulis parvis brevissime pedunculatis per 2–3 in axillis foliorum ultimorum confertis; umbellulae florum ♂ 4 mm. diametro; bracteae involucrales 4, ovatae, membranaceae, extus villosae intus glabrae; flores in umbellulis 3; pedicelli minuti; perianthii lobi obovati, 1–1·5 mm. longi ♂, sub 1 mm. ♀, extra villosi. *Stamina* florum ♂ 9, exserta; ordinum I et II 2 mm. longa, antheris parvis obovatis et filamentis longe pilosis; ordinis III similia, glandulis 2 globosis subsessilibus prope basin filamentorum; ovarii rudimentum 0. *Staminodia* florum ♀ 9, minuta; ordinum I et II clavata, filamentis pilosis; ordinis III subulata, glandulis 2 globosis prope basin. *Ovarium* globosum, stylo crasso curvato, stigmate peltato. *Drupa* (immatura) obovoidea, apiculata, perianthii tubo incrassato, lobis et staminodiis persistentibus suffulta.

Malay Peninsula. Perak: at Temango, *Ridley*, 14,603.

Litsea Ridleyi, *Gamble* [Lauraceae-Litseeae]; species *L. Wallichii*, Hook. f., affinis, differt foliis puberulis et haud prominenter areolatis.

Arbor; ramuli modice crassi, fulvi, juniores minute ferrugineo-pubescentes. *Folia* chartacea, alterna; elliptico-oblonga vel lanceolata, apice obtusa vel acuta et saepe mucronata, basi longe attenuata, supra lucida, costa excepta glabra, infra subglauca puberula; 10–25 cm. longa, 4–8 cm. lata; costa gracilis, supra vix prominens; nervi utrinque 7–10, saepe irregulares vel ramosi, supra impressi, marginem versus curvati, 2 superiores ad acumen; nervuli transversi irregulares; reticulatio minute areolata; petiolus crassus, supra complanatus, rugosus, nigrescens, 1·5–2·5 cm. longus. *Flores* in umbellulis brevibus pedunculatis in racemis brevissimis axillaribus vel lateralibus ferrugineo-villosis 5 mm. longis; umbellulae apertae 0·8–1 cm. latae; bracteae involucrales 4, ovato-oblongae, 4 mm. longae; flores in umbellulis 4–6; perianthii tubus brevis, lobi oblongi, villosi, 2–3 mm. longi. *Stamina* florum ♂ plerumque 9, ordinum I et II 3 mm. longa, antheris subquadratis et filamentis gracilibus villosis; ordinis III breviora, glandulis 2

subsessilibus paullo supra basin filamentorum; ovarium rudimentarium conicum, stylo gracili, stigmate bifido. *Staminodia* florum ♀ 9–12, ordinum I et II clavata, filamentis villosis 1–2 mm. longis, ordinum III et IV breviora glandulis 2 magnis paullo supra basin filamentorum. *Ovarium* ovoideum, glabrum, stylo curvato, stigmate subcapitato bifido. *Drupa* globosa, 1·5 cm. diametro, supra perianthii tubum incrassatum primo fere clausum deinde obconicum rugosum 6 mm. altum 0·8–1 cm. diametro ore crenulatum et lobis et staminodiis persistentibus munitum insidens; pedicellus paullo incrasatus; pericarpium laeve, lucidum, siccitate rugatum.

Malay Peninsula. Singapore: Changi, *Ridley*, 3803; at Reservoir road, *Ridley*, 5101; at Bukit Mandai, *Ridley*, 3836, 4701, 5064, 10,833; at Holland road, *Hullett*.

Litsea quercina, *Gamble* [Lauraceae-Litseeae]; species *L. castaneae*, Hook. f., affinis, foliis magis coriaceis minoribus nervis paucioribus differt.

Arbor; ramuli griseo-brunnei, graciles, juniores griseo-pubescentes sicut innovationes et petioli et foliorum costa. *Folia* coriacea, alterna, elliptica vel elliptico-ovata, apice obtusa et mucronata, aliquando emarginata, basi rotundata; utrinque grisco-brunnea, supra lucida, nervis exceptis glabra, infra minute puberula; 6–8 cm. longa, 3–5·5 cm. lata; costa pubescens, profunde impressa; nervi utrinsecus 7–9, supra impressi, ad marginem curvati; nervuli transversi obscuri; reticulatio areolata, utrinque sub lente conspicua; petiolus 0·8–1 cm. longus, gracilis. *Flores* in umbellulis, pedunculis 6–8 mm. longis muniti, in racemis brevissimis lateralibus. *Drupa* ellipsoideo-oblonga, 2 cm. longa, 1 cm. diametro, supra perianthium incrassatum cupuliforme insidens; cupula siccitate nigra, 7 mm. alta, 9 mm. diametro, ore rotundo; pedicellus incrassatus, crassissimus, 4 mm. longus; pericarpium laeve, lucidum, flavescens, siccitate rugatum.

Malay Peninsula. Perak: Gunong Batu Peak; at lower camp, *Wray*, 1174.

Litsea cylindrocarpa, *Gamble* [Lauraceae-Litseeae]; species *L. castaneae*, Hook. f., affinis, foliis magis coriaceis obovatis subglaucis, drupa elongata et tubo perianthii fructifero multo minore differt.

Arbor patula, ad 30–40 m. alta, 9–12 m. trunci diametro; ramuli modice crassi, laeves, grisei, juniores angulati minute griseo-puberuli sicut etiam inflorescentia. *Folia* coriacea, alterna, elliptica vel elliptico-oblonga vel obovata, apice obtuse acuta vel attenuata; supra nervis exceptis glabra, subtus minute puberula, 9–18 cm. longa, 4–9 cm. lata; costa gracilis, impressa; nervi utrinque 6–12, paralleli, profunde impressi, primo subrecti, deinde prope marginem curvati; nervuli transversi multi, paralleli, obscuri sicut reticulatio; petiolus 1–2·5 cm. longus, supra sulcatus et puberulus. *Flores* in umbellulis longiuscule (ad 1 cm.) pedunculatis in racemis griseo-pubescentibus axillaribus vel lateralibus ad 1·5–1·7 cm. longis saepe fasciculatis; racemi bracteae ovatae, acutae, deciduae; bracteae involucrales ovato-orbiculares, 4–5 mm. longae, concavae; flores in umbellulis 5; pedicelli breves, fusco-villosi; perianthii lobi oblongi, acuti, membranacei, villosi, 2–3 mm. longi. *Stamina* florum ♂ 8–13, plerumque 9, ordinum I et II ad 5 mm. longa, antheris ovatis et

filamentis villosis gracilibus, aliquando glandulis 1–2 prope basin; ordinum III et IV breviora et glandulis 2 parvis munita; ovarium rudimentarium rotundatum, villosum, stylo gracili, stigmate obliquo. *Staminodia* florum ♀ ignota. *Drupa* cylindrico-oblonga, 2 cm. longa, 7–9 mm. lata, apice obtusa, supra perianthii tubum incrassatum cupuliformem 5 mm. altum 7 mm. latum ore truncato insidens; pedicellus crassus, complanatus, 5 mm. longus; pericarpium rubrum, siccitate rugosum; cotyledones oblongi.

Malay Peninsula. Province Wellesley: at Nibong Tibal, *Curtis*, 3473; at Krian, *Ridley*, 9388. Perak: on low ground, *King's Collector*, 5500, 5568, 6207, 6673; at Bruas, *Burn-Murdoch*, 211.

Borneo. Base of Matang, *Ridley*, 11,673.

Litsea Wrayi, *Gamble* [Lauraceae-Litseeae]; species *L. salicifoliae*, Roxb., affinis, foliis minoribus, fasciculis umbellularum paucioribus et drupae cupula multo majore differt.

Arbor, ad 20–25 m. alta et 60 cm. trunci diametro; ramuli graciles, griseo-fulvi, juniores angulati, parce puberuli. *Folia* chartacea, alterna, elliptico-oblonga vel oblongo-lanceolata vel -oblanceolata, apice acuminata, basi longe attenuata vel acuta, supra lucida, glabra, infra rufescentia, glabra vel juniora puberula; 10–17 cm. longa, 3–5 cm. lata; costa gracilis, supra paullo impressa; nervi utrinque 10–13 vix impressi, obliqui, ultimi inter se arcuatim juncti; nervuli transversi graciles, irregulares, saepe ramosi; reticulatio areolata; petiolus gracilis, 1·5–2·5 cm. longus. *Flores* (alabastra tantum) in umbellulis breve pedunculatis in fasciculis vel racemis brevissimis axillaribus vel lateralibus; pedunculi 4–6 mm. longi, subglabri vel villosi; bracteae ovatae, caducae; bracteae involucrales 4–5, extus villosae, intus glabrae; flores in umbellulis 5–6; perianthii lobi 6, oblongi, obtusi vel acuti, extus villosi. *Stamina* florum ♂ 12, glabra, ordinum I et II antheris acutis; ordinum III et IV antheris obtusis glandulis 2 sessilibus filamentorum ad mediam partem; ovarium rudimentarium ovatum, stylo brevi, stigmate fisso. *Staminodia* florum ♀ etiam 12, glabra; ordinum I et II clavata, ordinum III et IV subulata, glandulis 2 sessilibus sicut in ♂. *Ovarium* ovoideum, stylo crasso curvato, stigmate capitato. *Drupa* globosa, apice paullo conica, 1 cm. diametro, supra perianthii tubum incrassatum albo-maculatum insidens; cupula juventute fere clausa, ore minimo, matura obconica, 8 mm. alta, 1·2 cm. diametro, margine truncato laevi; pedicellus incrassatus, paullo complanatus, 4 mm. longus; pericarpium album, cereum, siccitate flavum.

Malay Peninsula. Perak: at Waterfall Hill, *Wray* 1853, 4036; *Scortechini*; hill forests near Larut, 250–450 m., *King's Collector*, 6908, 7569.

Litsea Teysmanni, *Gamble* [Lauraceae-Litseeae]; species *L. Panamonjae*, Hook. f., affinis, foliis coriaceis obtusis vel abrupte acuminatis, racemis brevioribus glabris differt; *L. myristicaefoliae*, Hook. f., etiam affinis sed racemis longioribus et perianthii tubo fructifero differt.

Arbor; ramuli crassi, cortice pallido lenticellato, juniores nigrescentes. *Folia* coriacea, alterna, glabra; elliptico-oblonga vel obovata, apice obtusa vel abrupte cuspidato-acuminata, basi

acuta et saepe inaequalia, supra lucida, infra rufo-grisea, marginibus recurvis; 10–17 cm. longa, 4–6 cm. lata; costa mediocriter crassa, infra prominens; nervi utrinque 8–12, graciles, primo recti, sed marginem versus curvati et superiores arcuatim juncti; nervuli transversi irregulares, ramosi, reticulatione late areolata; petiolus crassus, 1·5–3 cm. longus. *Flores* in umbellulis pedunculatis in racemis gracilibus axillaribus 2–5 cm. longis; pedunculi 4–6 mm. longi; rhachis glabra, angulata, nigrescens; bracteae involucrales 4, minute puberulae vel glabrae; flores in umbellulis (♀ tantum) 5; pedicelli villosi, 1 mm. longi; perianthii tubus extus villosus, intus ore excepto glaber; perianthii lobi oblongi, obtusi, 1 mm. longi. *Stamina* florum ♂ nondum visa; staminodia florum ♀ 12, ordinum I et II clavata, filamentis parce villosis, ordinum III et IV subulata, apice rotundata vel acuta, glandulis 2 magnis ovatis ad basin. *Ovarium* ovoideum, stylo crasso primum curvato; stigmate peltato trilobo. *Drupa* primum ovoidea, deinde globosa, 1·5–1·8 cm. diametro, supra perianthii tubum incrassatum rugosum primum cupuliformem tandem complanatum 1·2 cm. altum margine undulatum insidens, pedunculo paullo complanato 1–5 cm. diametro; pericarpium maculatum, siccitate rugosum.

Malay Peninsula. Perak: at Kotah and Simpang, *Wray*, 2409, 3019; in dense jungle on low ground, *King's Collector*, 6689. Malacca: at Merliman, *Ridley*, 5845.

Bangka. *Teysmann.*

Borneo. Sarawak, *Beccari*, 1649, 4061.

Litsea machilifolia, *Gamble* [Lauraceae-Litseeae]; species *L. Teysmanni*, Gamble, affinis, foliis longe acuminatis, drupa minore et perianthii tubo fructifero crassiore differt.

Arbor, ad 12–24 m. alta et 40–50 cm. trunci diametro; ramuli graciles, nigrescentes. *Folia* coriacea, alterna; oblongo-lanceolata, apice longe acuminata, basi acuta vel cuneata, saepe inaequalia; supra lucida, glabra, infra glaucescentia et minute puberula, marginibus paullo recurvis; 10–20 cm. longa, 3–7 cm. lata; costa gracilis, prominens, praecipue infra; nervi utrinque 10–15, obscuri, immersi, curvati et prope marginem arcuatim juncti; nervuli transversi pauci, obscuri, reticulatione minute areolata; petiolus gracilis, siccitate niger, 1–2 cm. longus. *Flores* in umbellulis graciliter pedunculatis, in racemis glabris paniculatis axillaribus vel subterminalibus, 7–9 cm. (♂) vel 3–5 cm. (♀) longis; pedunculi 4–5 mm. longi; rhachis angularis, nigra; racemorum bracteae paucae, ovatae, caducae; bracteae involucrales 4–5, orbiculares, glabrae; flores in umbellulis 5, parvi; pedicelli 1 mm. longi, parce villosi; perianthii tubus 1–1·5 mm. longus, ore excepto glaber; perianthii lobi 6–8, 2 mm. (♂) vel 1 mm. (♀) longi, ciliati et glandulosi. *Stamina* florum ♂ 9–13, plerumque 12, glabra, ordinum I et II 2–3 mm. longa, antheris ovatis; ordinum III et IV breviora, glandulis binis stipitatis paullo supra filamentorum basim; staminodia florum ♀ 12–14, normaliter 12, ordinum I et II clavata, acuminata, 1 mm. longa, ordinum III et IV subulata, glandulis binis parvis ad mediam partem filamentorum. *Ovarium* florum ♂ rudimentarium, ovoideum, florum ♀ ovoideum, glabrum, stylo crasso curvato; stigmate capitato. *Drupa* globosa, 1 cm. diametro, ad dimidiam partem tubo perianthii incrassato 8 mm.

alto, 1·2 cm. lato suffulta ; pedicelli incrassati, clavati, complanati, 1–1·2 cm. longi ; pericarpium laeve, flavescens.

Malay Peninsula. Penang : Moniot's road, 300 m. *Curtis*, 795 ; *Scortechini*. Singapore : in garden jungle, *Ridley*, 4706, 3458.

Var. angustifolia, *Gamble*. *Folia* minora, angustiora, 2·5–3 cm. lata. *Paniculae* ramosae. *Stamina* plerumque 9. *Drupa* globosa 1·5–1·7 cm. diametro, in tubo perianthii incrassato rugoso, carnoso, complanato insidens ; pedicelli incrassati valde complanati et curvati, 1·4–2 cm. longi ; pericarpium primo viride, siccitate flavescens, rugosum.

Malay Peninsula. Perak : at Gunong Batu Patch, *Wray*, 416, 985, 1032, 1108 ; at Gunong Haram, *Scortechini*, 328, 588 ; Larut and Goping, *King's Collector*, 3561, 6113, 6815 ; Selangor : Bukit Kutu, *Ridley*, 7633. Malacca : at Brisu, *Derry*, 653. Singapore : at Bukit Mandai, *Ridley*, 6739 ; *King's Collector*, 1236.

XLVIII.—HYBRIDS RAISED AT KEW.

For many years past a number of hybrid plants have been raised at Kew, and in view of the general interest and importance of such work it has been considered advisable to bring together into as complete a record as possible the successes and failures in hybridization at Kew. In the following account, in order to facilitate reference, the hybrids have been arranged in alphabetical order, and in all cases the name of the female parent is placed first. They have been produced, as the list will show, in all the departments of the Royal Botanic Gardens.

Begonia Pink President Carnot (B. President Carnot × B. kewensis*).

This hybrid, raised in 1902, first flowered in 1904. It resembles the female parent in habit, in that the female flowers, which are pink in colour, remain on the plant for some time ; in addition to this, the male flowers, which in the mother plant do not open properly and drop off at an early stage, remain on the plant and open properly as in *B. kewensis*.

Begonia (B. coccinea × B. kewensis).

The hybrid was raised in 1902 and flowered in 1904. Habit intermediate between the two parents. The flowers are dull scarlet disposed in slender, pendulous inflorescences, as in *B. coccinea*.

Bravoa kewensis (B. geminiflora × B. [Prochynanthes] Bulliana).

The hybrid was produced in 1894 and flowered in 1899. Plant tufted, deciduous. Leaves 2 feet long, 1 inch in diameter. Inflorescence 4 feet high, bearing flowers in the upper part only. Perianth tubular, dull brownish-red on the outside, and yellow on the inside of the tube.

See note in Gardeners' Chronicle, 1899, xxvi., 112.

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* *B. kewensis* is a chance seedling or hybrid which originated at Kew about 15 years ago. It most nearly resembles *B. undulata*.

Brunsvigia (Brunsvigia Josephinae × Amaryllis Belladonna var. kewensis).

One seedling was obtained from this cross, which was made in September, 1898; it has not yet flowered, but is distinct in habit from both parents.

Calceolaria kewensis (C. Jefferies' Hybrid × Herbaceous Varieties).

This cross was made in 1904, the seedlings flowering in 1905. The plants were grown a second year and flowered profusely in May, 1906. *C. kewensis* seeds freely and comes true from seeds.

The plant is figured and described in the Gardeners' Chronicle, 1906, xxxix., 390, fig. 158.

Calceolaria (C. Clibrani × Herbaceous Varieties).

This cross was made in 1906 and the seedlings flowered the following spring. The blooms are about the same size as those of *C. kewensis*, but both habit and leaves are distinct. The pollen of six distinct colours of the herbaceous varieties was used on *C. Clibrani*, the result being a fairly wide range of colour and spotting in the flowers.

Callipsyche kewensis (C. mirabilis × C. aurantiaca).

Raised in 1898, flowered in 1901, seedlings show very little variation, and are intermediate in characters between the parents. The flowers are buff-yellow in colour, with long pendulous stamens of a creamy-white shade. The flowers of *C. amabilis* are white, while those of *C. aurantiaca* are orange. The hybrid is fertile, and seedlings have been raised from it.

Campanula (C. thyrsoides × C. spicata).

Plants intermediate in character between these two species appeared amongst a batch of seedlings raised in 1900 from seed of *C. thyrsoides* which had ripened in the Alpine House. The cross was probably effected by insects, the two parents being in flower at the same time in the house. Plants flowered the following year, having a longer, looser inflorescence than is usual in *C. thyrsoides*, while the flowers were also intermediate in character, Seeds saved from the hybrids did not retain their character, but reverted to *C. thyrsoides*.

Cheiranthus hybridus (Cheiranthus mutabilis × C. Cheiri—yellow variety).

A few seeds were obtained from this cross, made in 1897, and from one, *C. hybridus* was raised. This grows into a many-branched plant of more vigorous habit than the female parent. The fragrant flowers are small and borne in slender racemes in spring. They are purple throughout the early stages, but turn to a yellowish colour with age. It requires greenhouse culture.

Cheiranthus kewensis (C. hybridus × C. Cheiri—red variety).

The cross was made in May, 1899, and one plant was raised which flowered in January, 1900. Its leaves are similar to those of *C. Cheiri*, but the flowers are intermediate in character. The flowers are fragrant and borne freely in long racemes. They vary in colour, at different stages, from yellow to brown and then to purple. It is usually grown indoors and shows to the best advantage in sunny weather during February and March.

A description of the two hybrids was published in The Garden, 1901, lix., 178.

Cynorchis kewensis (C. purpurascens × C. Lowiana).

The seedlings raised from this cross, made in 1901, flowered in 1903. In habit they resemble *C. Lowiana*, the flowers being intermediate in size and dull purple-red in colour.

Cytisus kewensis (C. Ardoinii × C. albus).

This hybrid was obtained in 1891 through insect agency, and appeared among a batch of seedlings of the former parent. It is now widely cultivated in gardens. The habit is quite prostrate and the flowers of a pale sulphur-yellow.

Cytisus Beanii (C. Ardoinii × C. purgans).

This cross was also effected by some insect in 1892. It is a low bush with golden-yellow flowers.

Cytisus Dallimorei (C. scoparius var. Andreanus × C. albus).

The mother plant of the cross was grown in a pot and fertilised under glass in 1900. Only two plants were raised, one of which had pale yellow flowers and showed no influence of the mother plant in colour, but was of great vigour. The other, a much weaker plant, flowered in 1904 and had pale purple blossoms, and has been named *C. Dallimorei*. Grafted on stocks of Laburnum the hybrid is now showing plenty of vigour and is undoubtedly one of the most distinct and beautiful of the taller brooms. It was given an Award of Merit at the Temple Show of 1910.

See Gardeners' Chronicle, 1910, xlvii., 397. The hybrid is fertile, but it is not yet known whether it will breed true.

Disa kewensis (D. grandiflora × D. tripetaloides).

This hybrid was the result of a cross effected in 1891, and flowered in 18 months from the sowing of the seed. The flowers are intermediate in colour, 1½ inches in diameter, with bright rose lateral sepals; the dorsal sepal is hooded as in *D. tripetaloides*, light pink in colour, with a few light red spots. The labellum is concave, pink, shading off at the base to pale yellow, and spotted with light red. Figured in Gartenflora, 1903, t. 1510.

Disa Premier (D. tripetaloides × D. Veitchii).

This plant resulted from a cross made in 1891. *D. Veitchii*, the male parent, is itself a hybrid between *D. grandiflora* and *D. racemosa*. The flowers are rich rosy-crimson, larger than those of *D. racemosa*. It was exhibited at the Royal Horticultural Society meeting on October 10th, 1893, and received a First Class Certificate.

Epidendrum kewense (E. xanthinum × E. evectum). The reverse cross was also made.

The first seedling from this cross, made in 1899, flowered in 20 months from germination. These hybrids showed diverse shades of colouring, the bulk of them being dull red or buff, suffused with yellow.

A few flowers were self-pollinated and also recrossed with both parents. For further information, *see* Orchid Review, 1907, pp. 58, 122.

Freesia kewenis (F. Armstrongii × F. Leichtlini).

This cross was made in 1903 and the seedlings flowered in the following year. The flowers are pale lilac-pink, suffused with pale yellow in the throat, about 1 inch in diameter, with a long tapering

tube and spreading limb. The habit of the hybrid is erect and slender as in *F. Armstrongii*.

Gladiolus (G. dracocephalus × G. primulinus).

The cross was made in 1906, and the seedlings flowered in 1909–10.

The seedlings all showed the predominance of the male parent in the long slender inflorescence, glaucous foliage, and in the ground colour of the flower, which is yellow. The red stripes which are so characteristic of the mother plant are only faintly developed in the hybrid.

The reverse cross was made but no good seeds were obtained.

Gladiolus (G. Colvillei albus × G. primulinus).

The cross was made in 1906, but only one plant flowered this year.

Habit intermediate; leaves glaucous; flowers buff-coloured, large and reflexed as in *G. Colvillei*, with deeper markings in the throat.

The seedlings are mostly weak and difficult to grow.

Gladiolus (G. primulinus × Lemoine's Hybrid—white variety).

The cross was made in 1906, and seedlings flowered in 18 months to two years from the date of germination.

Habit of seedlings intermediate; flowers with bright scarlet ground-colour, heavily blotched with pale lemon-yellow on the lip and throat. A few of the seedlings showed distinct striation with a darker shade of red. The flowers are about 3 inches in diameter and show the spreading or reflexed segments of the male parent.

Kalanchoe kewensis (K. flammea × K. Bentii).

Crossed in 1901 and flowered in 1902. The flowers are bright rose-pink in large corymbose cymes about a foot in diameter. Plant 2–4 feet high. The remarkable feature of this plant is that although both its parents have simple leaves, the hybrid has several leaves with one or two pairs of pinnae. It is described and figured in the Annals of Botany, xvii., pp. 435–441, pl. 21–23.

Kniphofia kewensis (K. pauciflora × K. Macowani).

Seeds sown in October, 1892. The plants flowered in October, 1893, the inflorescence being longer and looser than in *K. pauciflora*, while the flowers are tinged with red. It was published under the name of *K. pauciflora* × *Macowani* in the Gardeners' Chronicle, 1893, xiv., 424.

Lilium kewense (L. Brownii var. chloraster × L. Henryi).

Raised in July, 1897, seeds were sown the following November, and the first flower opened July 19th, 1900. The hybrid resembles *L. auratum* in habit, but the flowers are pale buff, with a few brown spots on the inner side of the segments. It is described and figured in The Garden, 1900, lviii., 99.

Musa kewensis (M. Mannii × M. rosacea).

This hybrid was produced in 1893. It has slender "stems" 3 feet high; leaves, 3–4 feet long, 6–10 inches broad; inflorescence a short spike, with decorative bright crimson bracts 4–6 inches long. Flowers in threes in the axils of each bract with a cream-coloured calyx and white petals. It flowered in 1895 and was figured for the Kew collection of drawings.

Nymphaea kewensis (N. Lotus var. alba × N. Devoniensis).

Raised in 1885; flowers large, 6 inches in diameter, with rosy-red petals and golden-yellow stamens. Habit as in *N. Lotus*.

N. Devoniensis itself is, by some botanists, referred to *N. Lotus*; others consider it to be a hybrid between *N. rubra* and *N. Lotus*. *N. kewensis* is figured in the Botanical Magazine, t. 6988.

Primula kewensis (P. floribunda × P. verticillata).

This hybrid appeared as a chance seedling among a batch of *P. floribunda* in 1899. It was exhibited at the meeting of the Royal Horticultural Society, February 27th, 1900, and was awarded a First Class Certificate. *See* the Gardeners' Chronicle, 1900, xvii., pp. 130, 195, fig. 63; Gardeners' Magazine, 1900, 232, with figs.

During the summer of 1900 the supposed parents were artificially crossed, and good seed was obtained from *P. floribunda*; a proportion of the resulting plants proved to be true *P. kewensis*.

During the summer of 1910 the following crosses were again made :—

No. 1. *P. verticillata** × *P. floribunda*.
„ 2. *P. floribunda* × *P. verticillata*.
„ 3. *P. verticillata* × *P. floribunda* var. *isabellina*.
„ 4. *P. floribunda* var. *isabellina* × *P. kewensis* (type).
„ 5. *P. floribunda* var. *isabellina* × *P. kewensis* (seedling form).
„ 6. *P. kewensis* × *P. floribunda* var. *isabellina*.

All the above crosses produced good seed with the exception of No. 6. No. 1 produced a quantity of what appeared to be good seed, but only a few plants have been raised; so far they are all unflowered.

Rehmannia Briscoei (R. Henryi × R. angulata).

This cross was made in 1908, the plants flowering in 1910. *R. Briscoei*—raised by Messrs. J. Veitch & Sons, and figured in the Gardeners' Chronicle, 1910, xlvii., 188—is the result of the reverse cross. The colour of the flowers is the same in the two hybrids, but the influence of *R. Henryi* is more marked in the Kew plant, in that it produces more numerous flowering growths from the base compared with the specimens of *R. Briscoei* produced by Messrs. Veitch. So far all attempts to fertilize the Kew hybrid either with its own pollen or that of either of the parents have proved abortive.

Rehmannia (R. Henryii × R. glutinosa).

A few plants have been raised this year but as yet have not flowered.

Rhododendron kewense (R. Griffithianum × R. Hookeri).

Crossed in 1874; flowered in the Temperate House in May, 1888. It has proved to be hardier than either parent, plants having withstood several winters in the Rhododendron Dell at Kew. It forms a sturdy, much branched plant, with leaves 6 to 10 inches long by 2 inches broad; the flowers, which are disposed

* *P. verticillata* was also emasculated and carefully protected without being fertilized, and no seed was formed; the experiment was made in order to see whether ovules might not be produced by vegetative means.

in a large loose truss, are broadly campanulate, 3 inches across by 2 inches deep, of a pale flesh colour, the unexpanded buds being a deep rose.

See Gardeners' Chronicle, 1888, iii., 620, and The Garden, 1892, xlii., pl. 885.

Rhododendron (R. intricatum × R. indicum album).

The cross was made in 1908 and seedlings raised in 1909, but the plants have not yet flowered.

Rhododendron (R. Smirnowii × Named garden varieties).

A large number of hybrids was obtained from crosses made in 1893 and 1894, most of which were of very vigorous growth but inferior to the majority of garden varieties in their flowers. A few, such as those named "G. Thiselton-Dyer" and "Mrs. Prain," were of average merit. Hybrids from *R. Smirnowii* are likely to prove quite hardy.

Rhododendron Edith A. Boulton (R. Fortunei × R. Meteor).

This hybrid, produced in 1894, has proved to be one of the best of the *Fortunei* race of Rhododendrons—a race of considerable value in gardens, because they flower somewhat in advance of the better known hybrids and thereby lengthen the flowering season of the genus. It is curious in producing many flowers without stamens.

Rhododendron (R. Vaseyi × R. cinnabarinum).

Cross made in 1897.

The hybrid is a curious-looking small-leaved shrub which has not yet flowered.

Rhododendron (R. campylocarpum × R. Esmeralda).

One of the most desirable things in regard to the cultivation of Rhododendrons is the production of a race with good yellow flowers. It was thought that something in this way might be done by crossing these two, the former of which is pale yellow, the latter light red. About 25 hybrids were obtained from this cross made in 1897, only one of which has yet flowered, and this was as pale a yellow as the mother plant.

Rhododendron (R. Griffithianum × R. campylocarpum).

The hybrid, produced in 1898, bears cream-coloured flowers, but is not of striking merit.

Rhododendron Griffithianum ♀ was also crossed with various garden varieties. The best of the hybrids obtained were those from flowers pollinated with "Grand Arab" and "Ascot Brilliant." The trusses are red. The plants are only half-hardy at Kew.

Rhododendron (R. ciliatum × R. Edgeworthii).

The hybrid, obtained in 1900, is of interest in being exactly similar to the variety called "Princess Alice," a well-known greenhouse plant.

Rosa (R. macrophylla × R. rugosa).

It is impossible to obtain roses true from seed gathered from the plants growing together in the collection, because of the cross fertilization caused by bees. The result is nearly always a worthless mongrel, and the propagation of roses by seed from this source is no longer attempted. Amongst the hybrids formerly so raised, however, is a very handsome unnamed one with the

parentage given above. Its beauty is in its fruits, which are pear-shaped, as in *R. macrophylla*, but larger and of a brilliant scarlet-red. Miss E. Willmott is figuring this hybrid in her new work on the genus *Rosa*.

Senecio kewensis (Senecio [Cineraria] cruenta × Greenhouse Cinerarias).

In 1888 Kew introduced and flowered *Senecio* (*Cineraria*) *cruenta*, believed to be the progenitor of the popular race of greenhouse Cinerarias. It was afterwards crossed with the latter, and the seedlings thus obtained were known as Kew Cinerarias. Plants and seeds were distributed from Kew, and shortly afterwards a selection from them was shown by Messrs. Sutton & Sons under the name of *C. stellata*. Some of the Kew seedlings came fairly true from seeds and were known as "Kew Blue," "Kew White," &c.

Senecio Lady Thiselton-Dyer (S. Heritieri × Cineraria Kew Blue).

The cross was made in 1899.

The plant has the shrubby habit of *S. Heritieri*, and the blue and white flowers also show the ringed markings of the seed parent *S. Heritieri*. A plant was exhibited at the Royal Horticultural Society's meeting of April 28th, 1900.

See Gardeners' Chronicle, 1900, xxvii., p. 3 of supplement.

Shortia (S. uniflora grandiflora × S. galacifolia).

Cross made in 1910. The seeds were sown as soon as they were ripe and germinated in a short time, but the plants have not yet flowered. Flowers of *S. galacifolia* fertilized with pollen of *S. uniflora grandiflora* did not produce mature seed.

Spathoglottis kewensis (S. plicata var. Micholitzii × S. Vieillardii).

This hybrid, produced in 1900, flowered in 1903. The colour of the flowers mostly resembles that of the female, being bright reddish-purple, 2 inches in diameter, with the pale yellow markings on the lip and column which are characteristic of *S. plicata* var. *Micholitzii*.

Strelitzia kewense (S. Reginae × S. augusta).

Several plants were raised from the cross, made in March, 1898, one of which is growing in the Mexican House at Kew. This one flowered for the first time during the winter 1909–10 and was described as *S. kewense* in the Kew Bulletin, No. 2, 1910, p. 65. It is remarkable for its large leaves, which have blades 2 feet long and 15 inches wide. The flowers are pale ochre-yellow and blue.

See Gardeners' Chronicle, 1910, xlvii., 217, with figure.

Strelitzia (S. augusta × S. Reginae).

Several plants were obtained from the cross made in March, 1898, but as yet no flowers have appeared.

Streptocarpus Watsoni (S. parviflora × S. Dunnii).

Cross made in 1886, flowered in 1887.

The plant is monophyllous. Inflorescences numerous, produced in succession along the base of the midrib of the large single leaf. Flowers numerous, mauve-purple in colour shading to brownish-purple in the throat, 2 inches long, $1\frac{1}{4}$–$1\frac{1}{2}$ inches broad. Plant dies after flowering, producing no seed.

See Gardeners' Chronicle, 1887, ii., 214, fig. 52.

Streptocarpus kewensis (S. Rexii × S. Dunnii).

Cross made in 1886, seedlings flowered in 1887.

Habit as in *S. Rexii*, that is, it forms several leaves to each plant. Flower stems numerous, 3–8-flowered, bearing a compact mass of flowers as in *S. Dunnii*. Flowers mauve-purple, with brownish-purple marking in the throat.

See Gardeners' Chronicle, 1887, ii., 246, fig. 61.

Streptocarpus White Pet (S. Rexii × S. parviflora).

Cross made in 1886, plants flowered in 1887.

Habit as in *S. Rexii*; leaves 2 or more, 5–7 inches long, 2–3 inches broad. Inflorescence 4–6 inches high, bearing 2–5 flowers.

Streptocarpus Dyeri (S. Dunnii × S. Wendlandii).

Cross made in 1892, plants flowered in 1894–95.

Plant monophyllous; leaf 2–3 feet long and 16–18 inches broad. Inflorescence an erect, many-flowered cyme, 12–30 inches high; flowers reddish-purple. Figured in Garden and Forest, 1895, fig. 1.

For further particulars of the Kew hybrid *Streptocarpi*, see Gardeners' Chronicle, 1890, viii., 410.

Failures.

Hippeastrum × *Vallota purpurea.*
Hippeastrum × *Clivia miniata.*
Impatiens Oliveri × *I. Sultani.*
I. Oliveri × *I. Herzogii.*
Meconopsis aculeata × *M. heterophylla.* Seeds from this cross ripened and appeared to be good, but did not germinate.
Oxalis enneaphylla × *O. adenophylla.*
Primula kewensis × *P. floribunda.*
P. malacoides × *P. obconica.*
P. megaseaefolia × *P. obconica.*
P. obconica × *P. sinensis.*
P. sinensis × *P. verticillata.*
P. sinensis × *P. vulgaris.*
In nearly every case the reverse cross was also made.

Among shrubs, failures have been experienced with Hypericums and Ericas, not due, however, to any inherent incapability of hybridization in these genera, but to accident or defective fertilization.

XLIX.—DIAGNOSES AFRICANAE: XXXVIII.

1141. **Cliffortia Burchellii**, *Stapf* [Rosaceae-Potericae]; affinis *C. juniperinae*, Linn. f., sed ramulis glaberrimis stricto-erectis, sepalis masculis elliptico-ovatis, sepalis femineis basi connatis triangulari-ovatis incrassatis maturis in conum arcte conniventibus, stylo cylindrico incrassato differt.

Frutex ramosissimus, erectus; ramulis glaberrimis stricto-erectis neque divaricatis. *Folia* trifoliolata, sessilia; foliola subulata, apice breviter mucronata, undique glabra, dorso rotundato-carinata, primo

subconcava, deinde supra leviter canaliculata, marginibus subscabridis, 1·5–2 cm. longa; stipulae amplexicaules, subulatae. *Flores* ♂ solitarii vel duo in ramulis ad foliorum fasciculos reductis; bracteae ovato-lanceolatae, mucronato-acuminatae, 4–5 mm. longae, scariosae. *Sepala* 3, elliptico-ovata, mucronato-acuta, sub apice glandulis papillosis notata, 6–8-nervia. *Stamina* circiter 10 12. *Flores* ♀ in spiculas breves secundum ramos laxe dispositas aggregati; bracteae e basi amplexicauli late ovata in subulam productae, inferne 4 mm. latae. *Sepala* 3, basi connata, triangulari-ovata, acuta, in fructu persistentia, in conum arcte conniventia, circa 3 mm. longa, incrassata, ima basi constricta. *Stylus* erectus, cylindrico-incrassatus. *Stigma* plumosum. *Fructus* oblongo-ellipsoideus, 5–6 mm. longus, leviter costatus.

Cape Colony. George Div., *Burchell*, 5090, 5736; Outeniqua Mountains, *Rehmann*, 176. Knysna Div., *Burchell*, 5186.

1142. **Crotalaria lachnosema**, *Stapf* [Leguminosae-Genisteae]; affinis *C. lachnophorae*, A. Rich., sed foliis brevius petiolatis, stipulis subulatis vel filiformibus, corollae carina et vexillo densissime villosis distincta.

Suffruticosa, ad 2 m. alta (teste *Barter*). *Caulis* superne ramosus, teres, fulvo-tomentosus. *Folia* 3-foliolata; foliola oblonga, basin versus paulo cuneatim angustata, apice obtusissima, cuspidulata, intermedium 6–7·5 cm. longum, 1·8–2·5 cm. latum, lateralia ad 5 cm. longa, omnia subsessilia, supra adpresse pubescentia, infra velutina; petiolus 0·8–1·2 cm. longus, tomentosus; stipulae subulatae vel filiformes, 6–8 mm. longae, deciduae. *Racemi* terminales, pauciflori, fulvo-tomentosi; bracteae subulato-lanceolatae, acuminatae, 6 mm. longae; bracteolae filiformes, 6–8 mm. longae; pedicelli 8 mm. longae. *Calyx* dense fulvo-tomentosus, 1·2 cm. longus, ad $\frac{2}{3}$ quinquefidus, lobis triangulari-lanceolatis subaequalibus. *Corolla* flava, vexillum orbiculato-ellipticum, 1·8 cm. longum, breviter unguiculatum, dorso fulvo-velutinum; alae glabrae, lamina oblonga, 1·8 cm. longa, 6 mm. lata, ungue 4 mm. longo; carina oblique semicircularis (a latere visa), 2 cm. longa, medio 1·2 cm. alta, rostro vix 8 mm. longo obtuso et marginibus liberis exceptis omnino fulvo-villosa. *Legumen* cylindricum, obtusum, densissime ferrugineo-tomentosum, ultra 2·5 cm. longum, 1 cm. diametro. *Semina* (immatura) reniformia, fere 4 mm. longa, ultra 20. *C. lachnocarpa*, Baker in Oliv. Fl. Trop. Afr., ii. p. 33 (quoad pl. Barteri).

Tropical Africa. Liberia: Kakatown, *Whyte*. Nigeria: Nupe, *Barter*, 920.

1143. **Pterocarpus Osun**, *Craib* [Leguminosae-Dalbergeae]; a *P. Zenkeri*, Harms, cui affinis ramulis aculeatis, foliolis distincte mucronatis, nervis haud tam obliquis, fructu majore haud subglabro differt.

Arbor magna, 60 cm. diametro attingens (*ex Punch*); ramuli teretes juventute brunneo-tomentelli, mox glabri, aculeati, aculeis aliis deciduis aliis durescentibus. *Folia* 13–15 foliolata, 20–31 cm. longa; petioli 4·5–5 cm. longi, cum rachi brunneo-tomentelli, glabrescentes, supra canaliculati; stipulae deciduae, lineari-lanceolatae, acutae, ad 1·5 cm. longae, 3·5 mm. latae, utrinque fulvo-tomentellae; foliola alterna, plerumque oblonga, apice acuminata, mucronata vel

rarissime leviter emarginata, basi rotundata vel truncata, ad 13 cm. longa 5·3 cm. lata, juventute subtus, costa densius, parce pilosula, matura glabra, coriacea, margine integro, nervis lateralibus utrinque circiter 10 subtus prominulis cum nervulis supra conspicuis ; petioluli circiter 5 mm. longi ut in petiolis tomentelli. *Inflorescentia* ignota. *Fructus* sicco pallide brunneus, rotundatus, ad 12 cm. diametro, alis chartaceis ad 5 cm. latis pilulosis parcissime aculeatis, umbone dense aculeato aculeis basi incrassatis, stipite 1·3 cm. longo. *Semina* solitaria, oblonga, 2 cm. longa, brunnea, nitida.

Tropical Africa. Southern Nigeria : Ekam, *Holland*, 198. Lagos ; Ibadan Forest Reserve, *Punch*, 114 ; Ibadan, Fiditi, *Unwin* ; Western Province, *Unwin*, 1 ; Mamu, *Unwin* ; without locality, *Dodd*, 405.

From information supplied at various times to Kew and to the Imperial Institute it appears that the natives of S. Nigeria use five distinct plants for the production of red dye :—*Pterocarpus Osun*, *P. erinaceus*, Poir., *P. esculentus*, Sch. et Thonn., *Baphia nitida*, Afz., and a species of *Dracaena*. Of these the most important appear to be *P. Osun* and *Baphia nitida*. The latter gives a scanty supply from the place where the trunk has been injured, but with the former a more prolonged treatment is apparently necessary—it does not give the necessary dye when newly cut, so the natives allow it to lie in water in a cool place for 5 to 10 years.

According to Punch the natives give the name Osun or Irosun to both *P. Osun* and *B. nitida*. Dodd gives the native name Osun for *P. Osun*, and Unwin says the Yoruba name for *P. Osun* is Osun and the Benin name Ume. Unwin further reports that both trees are confined to the wet or forest region and are known as Iro-usun-pupa, implying that the colour of the wood is red, and Iro-usun-dudu, meaning black camwood.

In the letters accompanying the specimens the name camwood has been applied to the products of both trees, but barwood has only been used once and that to the product of *P. Osun*. A detailed account of camwood and barwood will shortly be published in "The Useful Plants of Nigeria," *K.B.*, Add. Ser. ix., Part II.

The native names for the other dye-producing plants quoted above are :—Ope Kankana or Osun Buke (*Dracaena* sp.), Apepe or Ara (*P. erinaceus*), Gbingbindo (*P. esculentus*).

1144. Leucospermum Bolusii, *Phillips* [Proteaceae-Proteeae] ; a *L. grandifloro*, R. Br., stigmatibus truncatis differt.

Rami villosi. *Folia* 5·5–9 cm. longa, 1·2–2 cm. lata, oblongo-lanceolata vel oblanceolata, apice obtusa, superne 3–5-obtuso-dentata, basi angustata, distincte venosa, minute sed distincte tomentosa. *Capitula* pedunculata, 5–6·25 cm. longa, circiter 3·75 cm. lata, pedunculo 1·8–2·4 cm. longo tomentoso bracteas ovatas acuminatas tomentosas gerente ; bracteae flores subtendentes 1·3 cm. longae, 7·5 mm. latae, obovato-spathulatae, aristatae, dense villosae, ciliatae. *Calycis tubus* 0·9 1 cm. longus, glaber ; lobi 1·7–1·9 cm. longi, spathulato-lineares, glabri, ciliati, apice dilatato 4 mm. longo ovato subacuminato subobtuso nigro-setoso paullo barbigero. *Stamina* sessilia, 2 mm. longa ; antherae ovatae. *Stylus* 4·5–5 cm. longus,

linearis, superne quadrangularis. *Stigma* 1·4 mm. latum, obliquum, truncatum. *Ovarium* 3 mm. longum, pilis longis vestitum. *Squamae* hypogynae 1·5 mm. longae, lineares, acuminatae, apice acutae.

South Africa. Bredasdorp Div.: near Elim, *Bolus*, 8586.

1145. Leucospermum Dregei, *Phillips* [Proteaceae-Proteeae]; affine *L. tomentoso*, R. Br., bracteis involucri acutis superne glabris differt.

Frutex erectus, 1·5–6 m. altus. *Rami* tomentosi, interdum pilosi. *Folia* 4·5–6·5 cm. longa, 3–6·5 mm. lata, linearia vel oblongo-linearia, apice obtusa, integra vel superne 3-obtuso-dentata, basi paullo angustata, vel attenuata, minute sed dense tomentosa. *Capitula* sessilia, 1·5–2·5 cm. longa, circiter 2–2·5 cm. lata, apice ramorum 2–4-nata. *Bracteae* 1–1·2 cm. longae, 3–5·5 mm. latae, ovatae, acuminatae, apice acutae, inferne pubescentes vel dense villosae, ciliatae, superne glabrae. *Calycis tubus* 4·5 mm. longus, glaber; lobi 1·5 cm. longi, spathulato-lineares, glabri, breviter ciliati, apice dilatato 3·5 mm. longo elliptico subacuto glabro vel pubescente. *Stamina* sessilia, 2 mm. longa; antherae oblongae. *Stylus* 1·5 cm. longus, trigonus, basi distincte incrassatus, supra ovarium constrictus. *Stigma* 2 mm. longum, cylindricum, obtusum, sulcatum. *Ovarium* 3 mm. longum, ellipticum, pilis longis vestitum.

L. tomentosum, var. α R. Br. in Trans. Linn. Soc., x. p. 102; Roem. & Schultes, Syst. Veg. iii. p. 360 (var. α only); var. *Dregei*, Meisn. in DC. Prodr., xiv. p. 258; *Leucadendrum pyrile*, Knight, Prot. p. 57.

South Africa. Malmesbury Div.: Groene Kloof, *Drège*; *Bolus*, 4324; *Zeyher*, 1467; between Klipfontein and Predikstoel, *Zeyher*, 1467; between Groene Kloof and Dassenberg, *Drège*; between Groene Kloof and Saldanaha Bay, *Drège*; Zwartland, *Zeyher*. Paarl Div.: Paarlberg, *Niven*.

1146. Leucospermum glabrum, *Phillips* [Proteaceae-Proteeae]; verisimiliter *L. conocarpo*, R. Br., affine, ramis et foliis glabris differt.

Frutex 2 m. altus. *Rami* minute tomentosi. *Folia* 5–10 cm. longa, 1·25–3·75 cm. lata, oblongo-obovata, oblanceolata vel lanceolata, apice acuta, subacuta vel obtusa, superne 8–13-obtuso-dentata, raro integra vel 1–7-dentata, basi angustata, distincte venosa, glabra. *Capitula* subsessilia, 5–7·5 cm. longa, 3·75–6·25 cm. lata. *Florum bracteae* 1·25 cm. longae, 7 mm. latae, obovatae, acuminatae, dense villosae. *Calycis tubus* 1 cm. longus, glaber; lobi 3·75–4·5 cm. longi, spathulato-lineares, superne breviter villosi, inferne pilosi, apice dilatato 6 mm. longo ovato acuto piloso. *Stamina* sessilia, 4·5 mm. longa; antherae oblongae, eglandulosae. *Stylus* 5 cm. longus, linearis, basi paullo ventricosus, glaber. *Stigma* 6 mm. longum, ovato-lanceolatum, apice subacutum. *Ovarium* 2 mm. longum, oblongum, longis pilis vestitum. *Squamae* hypogynae 1·5 mm. longae, lanceolatae, apice subacutae.

South Africa. George Div.: Forest near Touw River, *Burchell*, 5726; Springfield and edge of the Forest near the Poort, *Bowie*; between Cape Town and George Town, *Rogers*. Knysna Div.: Plettenberg Bay, *Bowie*; without locality, *Mund*.

1147. Leucospermum incisum, *Phillips* [Proteaceae-Proteeae]; a *P. mixto*, Phillips, forma stigmatis differt.

Rami pilosi vel minute tomentosi. *Folia* 6·25 cm. longa, 1·2–1·8 cm. lata, oblonga, vel oblongo-lanceolata, superne profunde 6–7-dentata, raro 5-dentata, basi rotundata, distincte venosa, glabra, vel inferne aliquando sparse pilosa. *Capitula* subsessilia, 6·25 cm. longa, circiter 5 cm. lata. *Calycis tubus* 6 mm. longus, glaber; lobi 3·2 cm. longi, spathulato-lineares, paullo tomentosi, longo-ciliati, apice dilatato 4 mm. longo ovato acuto pilis longis crassis vestito. *Stamina* 3 mm. longa; connectivum triangulariter dilatatum; lobi antherarum oblongi, connectivo superne adnati. *Stylus* 3 cm. longus, linearis, superne paullo quadrangularis, glaber. *Stigma* 3 mm. longum, ovato-conicum, apice subobtusum. *Ovarium* 2 mm. longum, oblongum.

South Africa. Worcester Div.: Breede River, near Darling Bridge, *Bolus*, 5235.

1148. **Leucospermum mixtum**, *Phillips* [Proteaceae-Proteeae]; verisimiliter *L. glabro*, Phillips, et *L. inciso*, Phillips, affine, ramis tomentosis et forma stigmatis differt.

Rami dense tomentosi. *Folia* 3·5–10·5 cm. longa, 1–3 cm. lata, lanceolata vel late-oblonga, apice obtusa, integra vel superne 3–6-dentata, basi angustata vel subcordata, distincte vel subdistincte venosa, glabra. *Capitulum* pedunculatum, 6 cm. longum, circiter 4·5 cm. latum, pedunculo 2·5 cm. longo villoso bracteas ovatas acuminatas apice acutas tomentosas 6 mm. longas gerente; bracteae flores subtendentes 1·5 cm. longae, 5 mm. latae, spathulatae, longe acuminatae, apice acutae, villosae, ciliatae. *Calycis tubus* 9 mm. longus; laminae 1·7 cm. longae, spathulato-lineares, pubescentes, apice dilatato 3 mm. longo ovato subacuto pubescente. *Stamina* sessilia, 1·75 mm. longa; antherae ovatae. *Stylus* 5·5 cm. longus, curvatus, superne quadrangularis, glaber. *Stigma* 1·75 mm. latum, truncatum, apice prominenter carinatum. *Ovarium* 3 mm. longum, ellipticum, pilis longis vestitum.

South Africa. From a specimen without locality or collector's name preserved in the Kew Herbarium.

1149. **Leucospermum Muirii**, *Phillips* [Proteaceae-Proteeae]; a *L. patulo*, R. Br., foliis majoribus differt.

Frutex 2 m. altus. *Rami* minute tomentosi, demum glabri. *Folia* circiter 2·2–5 cm. longa, 3–5·5 mm. lata, lanceolata, vel obovato-linearia, apice obtusa, superne 3–7-obtuso-dentata, basi attenuata, glabra. *Capitula* pedunculata, 2·5 cm. longa, circiter 2 cm. lata, pedunculo 9 mm. longo tomentoso bracteas lineares tomentosas gerente. *Bracteae flores* subtendentes 5·5 mm. longae, 3–4 mm. latae, obovatae, acuminatae, apice truncatae, dense villosae, ciliatae. *Tubus calycis* 2–3·75 mm. longus, glaber; lobi 1–1·3 cm. longi, spathulato-lineares, breviter villosi, apice dilatato 3 mm. longo elliptico interdum paullo acuminato obtuso piloso barbigero. *Stamina* sessilia, 2 mm. longa; antherae ovato-lanceolatae. *Stylus* 1·7 cm. longus, cylindricus, superne quadrangularis. *Stigma* 1–1·5 mm. longum, clavatum vel oblongo-conicum, apice obtusum, sulcatum. *Ovarium* 1·5 mm. longum, oblongum, pilis longis vestitum. *Squamae* hypogynae 1·4 mm. longae, lanceolato-lineares, apice subacutae.

South Africa. Riversdale Div.: Milkwoodfontein, *Galpin*, 4457; Zandhoogte, *Muir in Herb. Galpin*, 5309.

Named in honour of Dr. J. Muir, an enthusiastic South African collector. *Protea Susannae*, Phillips, *K.B.* 1910, p. 229, was named after Mrs. Muir, who has helped her husband with his collections.

1150. Spatalla Bolusii, *Phillips* [Proteaceae-Proteeae]; a *S. colorata*, Meisn., ramis albo-villosis et foliis albo-pilosis differt.

Rami dense albo-villosi. *Folia* 0·9–1·3 cm. longa, erecta, filiformia, apice acuta, mucronata. *Capitula* uniflora, in racemis sessilibus terminalibus solitariis 1·3–2·5 cm. longis. *Bracteae* 5 mm. longae, lineares, acutae, ciliatae, pilosae, pedunculo longiores. *Pedunculus* 1 mm. longus, pilosus. *Involucrum* 4 mm. longum, basi connatum, bilabiatum, pilosum, ciliatum; labium inferum profunde tripartitum; segmenta linearia, acuminata, acuta; segmentum medium 2 mm. longum. *Calycis tubus* 3 mm. longus, glaber; lobi 4 mm. longi spathulato-lineares, villosi, apice dilatato 1·6 mm. longo ovato acuto dense villoso barbigero. *Stamina* 3·75 mm. longa, apice glandulis minutis instructa. *Stylus* 7 mm. longus, filiformis, supra curvus. *Stigma* 0·75 mm. longum, obovatum. *Ovarium* circiter 1 mm. longum, villosum.

South Africa. Riversdale Div. : Garcia's Pass, *Bolus*, 11,361.

1151. Spatalla brachyloba, *Phillips* [Proteaceae-Proteeae]; a *S. cylindrica*, Phillips, dentibus labii exterioris et foliis brevioribus differt.

Frutex circiter 30 cm. altus. *Rami* pilosi, demum glabri. *Folia* 1·3–1·5 cm. longa, filiformia, apice subacuta, mucronata, subtiliter pilosa, demum glabra. *Capitula* pedunculata, uniflora, in racemis terminalibus sessilibus solitariis vel 2-natis, 2–2·5 cm. longis. *Bracteae* 4 mm. longae, lineares, apice subacutae, pilosae, ciliatae, pedunculo longiores. *Pedunculus* 2·5 mm. longus, pilosus. *Involucrum* 2·5 mm. longum, bilabiatum, pilosum; labium inferum tridentatum; dentes ovati, apice obtusi, ciliati, medius 0·75 mm. longus. *Calycis tubus* 1·5 mm. longus, glaber; lobi 2·6 mm. longi, spathulato-lineares, villosi, apice dilatato 1·6 mm. longo elliptico obtuso villoso dense barbigero. *Stamina* subsessilia, 0·75 mm. longa, orbiculata, glandulis minutis instructa. *Stylus* 4·5 mm. longus, filiformis. *Stigma* 0·75 cm. longum, obovatum, facie tuberculo minuto instructum. *Ovarium* 0·75 cm. longum, ovatum, dense villosum. *Squamae* hypogynae 0·75 mm. longae, lanceolatae, acuminatae, apice acutae.

South Africa. Stellenbosch Div. : Hottentots' Holland Mts., near Sir Lowry's Pass, *Mac Owan in Herb. Austro-Afric.*, 1762; *Mac Owan in Cape Government Herbarium.*

1152. Spatalla Burchellii, *Phillips* [Proteaceae-Protecae]; a *S. sericea*, R. Br., foliis brevioribus et glabris differt.

Frutex circiter 0·5 m. altus. *Rami* pilosi, demum glabri. *Folia* 0·6–1·3 cm. longa, filiformia, apice acuta, mucronata, supra unisulcata, glabra vel aliquando sparse pilosa. *Capitula* uniflora, in spicis sessilibus terminalibus solitariis 0·6–1·2 cm. longis. *Bracteae* 4 mm. longae, lineares, acuminatae, apice acutae, longe ciliatae, involucris subaequales. *Involucrum* 3 mm. longum, basi connatum, bilabiatum, hirsutum; labium inferum profunde trifidum; laminae ovatao-lanceolatae, acuminatae, apice subacutae, ciliatae. *Calycis*

tubus 1·5 mm. longus; lobi 4·5 mm. longi spathulato-lineares, villosi, apice dilatato ovato villoso barbigero dense. *Stamina* 0·5 mm. longa, orbiculata, apice glandulis minutis globosis instructa. *Stylus* 3·5 mm. longus, cylindricus. *Stigma* 0·5 mm. longum, obovatum. *Ovarium* 1 mm. longum, globosum, dense villosum. *Squamae* hypogynae 0·75 mm. longae, lineares.

South Africa. George Div.: Cradock Berg, near George, *Burchell*, 5899.

1153. **Spatalla cylindrica**, *Phillips* [Proteaceae-Proteeae]; a *S. longifolia*, Knight, inflorescentiis sessilibus, a *S. Galpinii*, Phillips, foliis longioribus differt.

Rami dense pilosi, demum glabri. *Folia* 2·5–4 cm. longa, filiformia, apice obtusa, obtuse mucronata, supra 1-sulcata, dense villosa, demum glabra. *Capitula* pedunculata, uniflora, in racemis terminalibus sessilibus solitariis 4·5–5 cm. longis. *Bracteae* 2·5 mm. longae, pedunculo subaequales. *Pedunculus* 3 mm. longus, hirsutus. *Involucrum* 2·5 mm. longum, bilabiatum, sericeo-pilosum, ciliatum; labium inferum tridentatum; dentes ovati, apice subacuti, medius 1 mm. longus. *Calycis tubus* 1 mm. longus; lobi 4–5 mm. longi, spathulato-lineares, superne albo-hirsutae, in medio nigro-setosae, apice dilatato 1 mm. longo ovato acuto villoso dense barbigero. *Stamina* subsessilia, 0·75 mm. longa, orbiculata, apice glandulis minutis globosis instructa. *Stylus* 4·5 mm. longus, filiformis. *Stigma* 1 mm. longum, obovatum. *Ovarium* 1 mm. longum, globosum. *Squamae* hypogynae 1·5 mm. longae, lineares.

South Africa. Stellenbosch Div.: Mts. round Sir Lowry's Pass, *Burchell*, 8212; *Schlechter*, 7230.

1154. **Spatalla ericoides**, *Phillips* [Proteaceae-Proteeae]; a *S. sericea*, R. Br., foliis brevioribus differt.

Rami pubescentes, demum glabri. *Folia* 5–7 mm. longa, apice subobtusa, obtuse mucronata, supra unisulcata, sparse pilosa, demum glabra. *Capitula* uniflora, in spicis terminalibus solitariis 1·5–2·0 cm. longis. *Bracteae* 3 mm. longae, ovato-lanceolatae, acuminatae, apice subacutae, dense pilosae, ciliatae. *Involucrum* 5 mm. longum, basi connatum, bilabiatum, dense sericeo-pilosum; labium inferum tridentatum, dentes laterales ovati, apice acuti, dense ciliati, medius angustior, dense ciliatus. *Calycis tubus* 1·5 mm. longus, glaber; lobi 4·5 mm. longi, spathulato-lineares, paullo tomentosi, apice dilatato 1 mm. longo ovato obtuso villoso barbigero dense. *Stamina* sessilia, 0·75 mm. longa, ovata, apice glandulis minutis ovatis instructa. *Stylus* 5 mm. longus, filiformis. *Stigma* 0·75 mm. longum, obovatum, basi subacutum, facie tuberculo minuto instructum. *Ovarium* 0·75 mm. longum, villosum. *Squamae* hypogynae 1 mm. longae, lineares.

South Africa. Without collector or locality *in Herb. Austro-Afric.*

1155. **Spatalla Galpinii**, *Phillips* [Proteaceae-Proteae]; a *S. longifolia*, Knight, dentibus labii exterioris brevioribus differt.

Rami albo-hirsuti, demum glabri. *Folia* 1·3–1·7 cm. longa, filiformia, apice acuta, mucronata, supra 1-sulcata, basi vix attenuata, pilosa, demum glabra. *Capitula* pedunculata, uniflora, in racemis terminalibus pedunculatis solitariis vel 2-natis 2·5–4 cm. longis; pedunculus 1·3 cm. longus, hirsutus. *Bracteae* 5 mm. longae,

lineares, apice subacutae, basi ciliatae, pedunculo longiores. *Pedunculus* circiter 1·3 cm. longus, hirsutus. *Involucrum* 3 mm. longum, bilabiatum, pilosum, ciliatum ; labium inferum tridentatum ; dentes ovati, subacuminati, apice acuti ; medius dens 0·75 mm. longus. *Calycis tubus* 1·5 mm. longus ; lobi 4 mm. longi, spathulato-lineares, superne albo-hirsuti, glabri, paullo nigro-setosi ; apice dilatato 1 mm. longo ovato dense villoso. *Stamina* sessilia, 0·75 mm. longa, orbiculata, apice glandulis minutis instructa. *Stylus* 4 mm. longus, filiformis, aliquid compressus, paullo sulcatus. *Stigma* 1 mm. longum, obovatum. *Ovarium* 1 mm. longum, globosum, dense villosum. *Squamae* hypogynae 0·15 mm. longae, lineares.

South Africa. Without locality, *Thoms.* Caledon Div. : Klein River, *Schlechter*, 7608 ; Hermanuspetrusfontein, *Galpin*, 4485. Stellenbosch Div. : Hottentots' Holland Mts., *Pappe*, 6.

1156. Spatalla mucronifolia, *Phillips* [Proteaceae-Proteeae] ; a *S. nana*, Knight, et *S. procera*, Knight, foliis brevioribus differt.

Rami pilosi vel tomentosi. *Folia* 1–1·7 cm. longa, linearia, apice acuta, mucronata, supra unisulcata, pilosa. *Capitula* 3–4-flora in terminalibus racemis sessilibus vel subsessilibus solitariis vel 3–5-natis, 2·5–4 cm. longis. *Bracteae* 5 mm. longae, ovato-lanceolatae, apice acutae, pilosae, ciliatae, pedunculo longiores. *Pedunculus* 2 mm. longus, villosus. *Involucrum* 5 mm. longum, basi connatum, bilabiatum, pilosum ; labium superum obsoletum ; labium inferum profunde tripartitum ; segmenta 4 mm. longa, ovata, acuminata, apice acuta, ciliata. *Calycis tubus* 2 mm. longus ; lobi 4·5 mm. longi, spathulato-lineares, villosi, apice dilatato 3 mm. longo ovato vel elliptico obtuso dense villoso. *Stamina* sessilia, 1 mm. longa, apice glandulis ovatis instructa. *Stylus* 6 mm. longus, cylindricus, oblique insertus. *Stigma* 0·75 mm. longum, ellipticum, facie tuberculo minuto instructum. *Ovarium* 1·5 mm. longum, oblongum, villosum. *Squamae* hypogynae 2 mm. longae, lineares.

South Africa. Clanwilliam Div. : Cederberg Mts., at Pakhuis Pass, *Bolus*, 9083 ; Pakhuisberg, *Schlechter*, 10,814, 8611 ; without precise locality, *Drège* ; *Wallich.*

1157. Spatalla pilosa, *Phillips* [Proteaceae-Proteeae] ; a *S. molli*, R. Br., dentibus labii exterioris brevioribus, a *S. nivea*, R. Br., foliis bracteis brevioribus differt.

Rami dense pilosi, demum inferne pubescentes vel glabri. *Folia* 1·2–1·9 cm. longa, filiformia, apice subobtusa, subacute mucronata, minute punctata, dense pilosa, demum glabra. *Capitula* pedunculata, uniflora, in terminalibus solitariis racemis 2·0–2·5 cm. longis. *Bracteae* 3·5 mm. longae, lineares, apice acutae, ciliatae, pedunculo longiores. *Involucrum* 2·5 mm. longum, bilabiatum, pilosum ; labium inferum bipartitum ; dentes 1·5 mm. longi, ovati, apice acuti, ciliati; pedunculus 2·5 mm. longus, pilosus. *Calycis tubus* 1·5 mm longus, glaber ; lobi 3 mm. longi, spathulato-lineares villosi, apice dilatato 0·6 mm. longo ovato subacuto villoso dense barbigero. *Stamina* sessilia, 0·75 mm. longa, apice glandulis minutis ovatis instructa. *Stylus* 4 mm. longus, filiformis. *Stigma* 0·75 mm. longum, oblique obovatum, facie tuberculo minuto instructum. *Ovarium* 0·75 mm. longum, pilosum. *Squamae* hypogynae 0·75 mm. longae, lineares.

South Africa. Stellenbosch Div. : Hottentots' Holland Mts., *Zeyher*, 3720 (partly).

1158. **Spatalla Wallichii**, *Phillips* [Proteaceae-Proteeae]; a *S. mucronifolia*, Phillips, foliis supra haud unisulcatis differt.

Frutex decumbens. *Rami* tomentosi, demum glabri. *Folia* 6–8 mm. longa, filiformia, apice acuta, mucronata, paullo incurva, supra plana, infra convexa, pilosa, demum glabra. *Capitula* 3–4-flora, in racemis laxis terminalibus pedunculis solitariis vel 2–3-natis, 2–3 cm. longis; pedunculus racemi villosus. *Bracteae* 4 mm. longae, lanceolatae vel lineari-lanceolatae, apice acutae, 3–5-nerves, ciliatae, pilosae. *Pedunculus* capituliger 2 mm. longus, villosus. *Involucrum* basi connatum, 4 mm. longum, bilabiatum, ciliatum, pilosum; labium inferum inaequaliter tripartitum. *Calycis tubus* 2 mm. longus, villosus, basi glaber; lobi 5 mm. longae, spathulato-lineares, villosi, apice dilatato 1·5 mm. longo ovato subacuto villoso barbigero. *Stamina* sessilia 0·75 mm. longo; antherae orbiculatae, apice glandulis globosis instructae. *Stylus* 5 mm. longus, linearis, supra curvus. *Stigma* 0·5 mm. longum, obovatum, facie tuberculo minuto instructum. *Ovarium* obovato-oblongum, dense pilosum. *Fructus* subpedicellatus, 4·5 mm. longus, ellipticus, subobtusus, pilosus.

South Africa. Cederberg, *Wallich*.

Described from a single specimen preserved in the Herbarium of the British Museum.

1159. **Struthiola Gilgiana**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 214, anglice [Thymelaeaceae]; affinis *S. usambarensi*, Engl., a qua foliorum adultorum marginibus pilosis recedit.

Rami erecti, pubescentes, superne dense foliati. *Folia* verticillata, sessilia, lineari-lanceolata, acuta, 12 mm. longa, 2 mm. lata, marginibus sparse pilosis exceptis glabra. *Flores* foliis paullo breviores. *Bracteolae* lineari-oblongae, obtusae, conduplicatae, 4 mm. longae, in marginibus et apice pubescentes. *Calycis tubus* gracilis, circiter 8 mm. longus, glaber; lobi lanceolati, acuti, 3 mm. longi, glabri. *Petala* ad basin divisa; segmenta teretia, circiter 0·7 mm. longa, carnosa. *Stylus* 4–5 mm. longus.

Tropical Africa. German East Africa: Usambara, slopes of Mtai, *Holst*, 2476, partly (mixed with *S. ericina*, Gilg).

1160. **Struthiola Albersii**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 215, anglice [Thymelaeaceae]; affinis *L. Thomsoni*, Oliv., a qua foliis patulis recedit.

Rami erecti, villosi, superne dense foliati. *Folia* verticillata, sessilia, lanceolata vel ovato-lanceolata, acuta vel subacuta, 8–15 mm. longa, 4–5 mm. lata, in marginibus reflexis et apice villosa, ceterum glabra. *Flores* folia aequantes, glabri. *Bracteolae* oblongae, obtusae, conduplicatae, 3 mm. longae, in marginibus et apice villosae. *Calycis tubus* gracilis, 8–12 mm. longus; lobi ovato-lanceolati, acuti, duo exteriores tubi trientem aequantes, apice pilis brevibus rigidis muniti. *Petala* ad basin divisa; segmenta teretia, circiter 0·7 mm. longa, carnosa. *Stylus* 4–5 mm. longus. *Fructus* ovoideus, acuminatus, circiter 2 mm. longus, glaber.

Tropical Africa. German East Africa: Usambara, Kwai, *Albers*, 191.

1161. **Gnidia Thomsoni**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 219, anglice [Thymelaeaceae]; affinis *G. huillensi*, Gilg, a qua foliis bracteisque valde acutis recedit.

Caules florentes erecti, graciles, ramosi, 15–22 cm. longi, glabri. *Folia* linearia, acuminata, acuta, 8–18 mm. longa, glabra. *Capitula* pedunculata, multiflora; bracteae involucrantes 6–8, anthesi erectae, ellipticae, acuminatae, acutae, 8 mm. longae, tenues, coloratae, costa distincta. *Flores* tetrameri, minute pedicellati; pedicellus apice sericeo-villosus. *Calycis tubus* circiter 12 mm. longus, infra articulationem glaberrimus, supra articulationem glandulosus, puberulus; lobi elliptici, concavi, obtusi, apice leviter incurvo. *Petala* ad papillas graciles capitatas 0·5–1 mm. longas reducta. *Antherae* verticilli inferioris imperfectae. *Ovarium* glabrum.

Tropical Africa. German East Africa: lower plateau north of Lake Nyasa, *Thomson*.

1162. **Gnidia montana**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 221, anglice [Thymelaeaceae]; bracteis coloratis, capitulis lateralibus pedunculatis, pedunculis erectis, foliis linearibus circiter 0·7 mm. latis distincta.

Caules florentes numerosi, erecti, pauciramosi, graciles, 22–30 cm. longi, glabri. *Folia* linearia, subacuta, 8–12 mm. longa, glabra. *Capitula* terminalia, pedunculata, multiflora; bracteae involucrantes circiter 8, anthesi erectae, oblongae vel ellipticae, subacutae vel acutae, 6–8 mm. longae, 4–6 mm. latae, tenues, coloratae, costa valde distincta. *Flores* tetrameri, rarius pentameri, pedicellati; pedicellus brevissimus, apice sericeo-villosus. *Calycis tubus* haud 12 mm. longus, infra articulationem glaberrimus, supra articulationem dense sericeo-pubescens; lobi oblongi, apice rotundati, circiter 2 mm. longi, extus sericeo-pubescentes. *Petala* obcordata, circiter 0·5 mm. longa, crassa, lutea. *Ovarium* glabrum.

Tropical Africa. Abyssinia: Kambata, about 1800 m., *Wellby*.

1163. **Gnidia nutans**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 221, anglice [Thymelaeaceae]; capitulo nutante, calycis tubo sericeo-pubescente distincta.

Caules florentes erecti, laxe ramosi, glabri, ramis numerosis longis. *Folia* numerosa, congesta, breviter petiolata, lineari-elliptica vel lineari-lanceolata, obtusa, 1·8–3 cm. longa, 4–8 mm. lata. *Capitula* pedunculata, multiflora; bracteae involucrantes 4–6, late ovatae vel suborbiculares, florum dimidium aequantes, scariosae, glabrae, exsiccando brunneae. *Flores* breviter pedicellati, tetrameri; pedicelli apice pilis erectis albis barbati. *Calycis tubus* circiter 12 mm. longus, infra articulationem glaber, supra articulationem dense pubescens; lobi oblongi, obtusi vel emarginati, circiter 2 mm. longi, subtus pubescentes. *Petala* ovata, obtusa, crassa, carnosa, circiter tertiam partem calycis loborum aequantia. *Ovarium* glabrescens.

Tropical Africa. Portuguese East Africa: mountains east of Lake Nyasa, *Johnson*. Nyasaland: between Kondowe and Karonga, 600–1800 m., *Whyte*, 330; Nyika Plateau, 1800–2100 m., *Whyte*; South Nyika mountains, 1200–2100 m., *Whyte*.

1164. **Gnidia ramosa**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 225, anglice [Thymelaeaceae]; affinis *G. Goetzeanae*, Gilg, a qua foliis obtusis recedit.

Frutex erectus, circiter 1 m. altus, multiramosus, glaber, ramis gracilibus. *Folia* brevissime sed distincte petiolata, lineari-oblonga, apice obtusa vel rotundata, versus basin angustata, 12–16 mm. longa, 2–3 mm. lata. *Capitula* pedunculata, parva, pauciflora; bracteae involucrantes 5–6, ovatae, abrupte acuminatae, circiter 6 mm. longae. *Flores* pedicellati, tetrameri; pedicellus brevissimus, pubescens, apice pilis longis erectis barbatus. *Calycis tubus* 6 mm. longus (an adultus ?), pubescens; lobi oblongi, apice rotundati, circiter 0·7 mm. longi, extus pubescentes. *Petala* minuta, inferne cylindrica, superne capitata. *Ovarium* glabrum.

Tropical Africa. Nyasaland: between Kondowe and Karonga, 600–1800 m., *Whyte*; Tanganyika Plateau, at Fort Hill, 1000–1200 m., *Whyte*.

1165. **Lasiosiphon Kerstingii**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 233, anglice [Thymelaeaceae]; affinis *L. Hoepfneriano*, Vatke, a quo foliis obtusis recedit.

Caules e rhizomate lignoso orti, circiter 22 cm. longi, tomentelli, versus apicem ramosi. *Folia* oblonga, obtusa, basin versus angustata, 1·8–2·5 cm. longa, 6 mm. lata, minute pubescentia. *Capitula* solitaria, terminalia, multiflora; pedunculus brevis, tomentosus; bracteae involucrantes circiter 8, anthesi erectae, oblongae, obtusae, florum $\frac{2}{3}$ aequantes. *Flores* in receptaculo claviformi villoso insidentes, pentameri, lutei. *Calycis tubus* 12–16 mm. longus, infra articulationem pilis fulvis dense sericeo-villosus, supra articulationem tomentosus; lobi late oblongi vel obovati, rotundati, 3 mm. longi, 2 mm. lati, extus sericeo-villosi. *Petala* linearia vel oblongo-linearia, integra vel plus minus bifida, tenuissima, calycis loborum circiter $\frac{2}{3}$ aequantia. *Discus* minutus. *Ovarium* pilis erectis dense sericeo-villosum. *Fructus* ignotus.

Tropical Africa. Togoland: Kirikiri, *Kersting*, 36.

1166. **Arthrosolen sphaerantha**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol vi., sect. 1, p. 235, anglice [Thymelaeaceae]; affinis *A. Poggei*, H. H. W. Pearson, a qua calycis tubo duplo longiore recedit.

Planta lignosa, circiter 0·5 m. alta, superne ramosa, glabra. *Folia* sparsa, sessilia, linearia, acuta, 8–18 mm. longa, 2 mm. lata. *Capitula* terminalia, multiflora; bracteae involucrantes circiter 10, biseriatae, ovatae, acuminatae, acutae, 12 mm. longae, 6 mm. latae, glabrae. *Flores* breviter pedicellati, tetrameri; pedicellus supra medium annulo pilorum munitus, pilis erectis albis sericeis. *Calycis tubus* 1·6 cm. longus, infra articulationem glaber, supra articulationem pubescens; lobi ovati, acuminati, acuti, circiter 3 mm. longi. *Ovarium* glabrum.

Tropical Africa. German East Africa: Uha; by the River Malagarazi, *Trotha*, 56.

1167. **Arthrosolen foliosa**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.* vol. vi. sect. 1, p. 237, anglice [Thymelaeaceae]; affinis *A. fulgenti*, H. H. W. Pearson, a qua bracteis involucrantibus flores aequantibus vel leviter superantibus recedit.

Caules florentes erecti, circiter 0·6–1 m. alti, ramis numerosis brevibus gracilibus foliosis. *Folia* linearia vel lineari-oblonga, obtusa vel subacuta, basin versus angustata, 2·5–3·8 cm. longa, glabra, venatione prominente. *Capitula* axillaria, pedunculata, circiter 12-flora; pedunculus 1·8–5 cm. longus, gracilis, plerumque aphyllus basi excepta; bracteae involucrantes 4, ellipticae vel elliptico-oblongae, apice rotundatae, in basin plus minus angustatae, membranaceae, haud coloratae, flores vix superantes, venis conspicuis. *Calycis tubus* 12–18 mm. longus, extus praecipue infra articulationem sericeo-villosus, intus glaber; lobi oblongi, obtusi, extus pubescentes, intus glabri. *Ovarium* glabrum.

Tropical Africa. Soudan: between Bammako and Guignula, *Chevalier*, 256.

1168. **Dicranolepis stenosiphon**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 240, anglice [Thymelaeaceae]; affinis *D. Schweinfurthii*, Gilg, a qua foliis subtus glabris vel glabriusculis differt.

Rami graciles, sparse pilosi. *Folia* breviter petiolata, rhomboidea vel oblique oblonga, caudato-acuminata, acuta vel obtusa, 5–8 cm. longa, 2·5–3·8 cm. lata, integra, glabra. *Flores* axillares, solitarii vel geminati, pentameri, 3·8–5 cm. longi. *Calycis tubus* gracilis, glaber vel sparse puberulus; lobi lanceolati, acuti, $\frac{1}{4}$ tubi aequantes, marginibus puberulis, venis parallelis. *Petala* dimidium calycis loborum superantia, ad basin divisa; segmenta 10, patentia, linearia, prope apicem plus minus incisa. *Ovarium* pilis paucis erectis prope apicem munitum, ceterum glabrum. *Fructus* (an maturus?) ovoideus, apiculatus, 8–12 mm. longus, glaber.

Tropical Africa. Cameroons: Bipinde, *Zenker*, 1277, 2762, 3026, 3655.

1169. **Dicranolepis glandulosa**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 242, anglice [Thymelaeaceae]; affinis *D. convallariodorae*, Gilg, a qua calycis tubo glanduloso differt.

Rami graciles, glabri. *Folia* sessilia, oblique oblonga, caudato-acuminata, obtusa, 10–19 cm. longa, 5–7·5 cm. lata, integra, supra glabra, subtus glabrescentia. *Flores* solitarii (?), sessiles, pentameri, 6·5–7·5 cm. longi, extus glandulis crassis pedicellatis dense vestiti. *Calycis tubus* latus; lobi ovati, obtusi, circiter 12 mm. longi. *Petala* ad basin divisa, calycis lobis duplo longiora, glabra; segmenta 10, oblonga vel anguste obovata, apice integra, rotundata, vel incisa. *Ovarium* glabrum; stylus gracilis, vix exsertus. *Fructus* globosus.

Tropical Africa. Cameroons: Batanga, *Dinklage*, 971; Bipinde, *Zenker*, 1951.

1170. **Dicranolepis polygaloides**, *Gilg ex H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 243, anglice [Thymelaeaceae]; affinis *D. laciniatae*, Gilg, a qua petalorum segmentis integris differt.

Rami primum dense pubescentes, demum glabri. *Folia* rhomboidea vel oblique ovata, acuminata, obtusa, 2·5–3·8 cm. longa, 1·2–1·8 cm. lata, integra, supra glabra vel glabriuscula, subtus pilis sparsis appressis; petioli brevissimi, dense pubescentes. *Flores* solitarii vel geminati, sessiles, pentameri, 3·2–3·8 cm. longi, dense pubescentes. *Calycis tubus* gracilis; lobi circiter $\frac{1}{4}$ tubi aequantes,

oblongo-ovati. *Petala* plerumque calycis lobos aequantia, ad basin divisa, glabra; segmenta linearia vel lineari-oblonga, integra. *Ovarium* glabrum. *Fructus* ignotus.

Tropical Africa. Cameroons: along the River Mungo, between Mundame and Otam, *Schlechter*, 12,889; North Cameroons, *Conrau*, 118.

The name *Dicranolepis polygaloides*, Gilg, first appeared, without description, in Schlechter, Westafr. Kautschuk-Exped. p. 301.

1171. **Dicranolepis pubescens**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.* vol. vi. sect. 1, p. 243, anglice [Thymelaeaceae]; affinis *D. laciniatae*, Gilg, a qua calycis tubo intus pubescente recedit.

Rami primum dense pubescentes, demum glabri. *Folia* rhomboidea vel oblique ovata, acuminata, obtusa, 5–6·3 cm. longa, 2–2·5 cm. lata, integra, supra glabra, subtus pilis sparsis appressis; petioli brevissimi, pubescentes. *Flores* axillares, solitarii, sessiles, nutantes, pentameri, 2·5–3·8 cm. longi, pubescentes. *Calycis tubus* supra apicem ovarii intus pubescens; lobi ovati, obtusi, 8–12 mm. longi, pubescentes, venis parallelis. *Petala* calycis lobos haud superantia, fere ad basin divisa, glabra; segmenta 10, oblonga, apice lato inciso. *Ovarium* glabrum. *Fructus* ignotus.

Tropical Africa. French Guinea: Kassa, north of Sierra Leone boundary, *Scott-Elliot*, 5066.

It has been found that the specimen referred to a new species of *Dicranolepis*, *D. parviflora*, H. H. W. Pearson in Dyer, Fl. Trop. Afr. vol. vi. sect. 1, p. 244 (1910), is identical with *D. Thonneri*, De Wild. et Th. Dur. in Comptes-rendus Soc. Bot. Belg. vol. xxxviii. p. 114 (1900), and Plantae Thonnerianae Congolenses, p. 29, t. 10.

1172. **Synaptolepis retusa**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.* vol. vi. sect. 1, p. 247, anglice [Thymelaeaceae]; calycis tubo e basi in apicem sensim ampliato, inflorescentia axillari, foliis haud ovatis distincta.

Frutex; ramis teretibus glabris, cortice rubello. *Folia* brevissime petiolata, elliptica, elliptico-oblonga vel obovata, retusa vel emarginata, interdum apiculata, basin versus angustata, 2·5–6·3 cm. longa, 1·2–2·5 cm. lata, coriacea, glabra, margine incrassato revoluto, supra glauca, subtus fulva, venatione subtus prominente. *Inflorescentiae* axillares, pauciflorae; flores breviter pedicellati; pedicelli laeves. *Calycis tubus* e basi leviter sensim ampliatus; lobi oblongi, obtusi, 2–4 mm. longi, glabri. *Fructus* ovoideus, 1·8 cm. longus (maturus?), calycis tubo persistente coronatus.

Tropical Africa. French Guinea, *Farmar*.

1173. **Craterosiphon Soyauxii**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.* vol. vi. sect. 1, p. 248, anglice [Thymelaeaceae]; foliis basi rotundatis a *C. scandente*, Engl. & Gilg, differt.

Planta glabra. *Folia* opposita, breviter petiolata, ovata vel elliptica, longe acuminata, obtusa, basi rotundata, 6·3–7 cm. longa, 3·2–3·8 cm. lata, integra, supra exsiccando glauca, subtus brunnea, nervis distinctis patentibus parallelis. *Flores* non visi. *Fructus* ovoideus, 2·5–3·2 cm. longus, 1·8 cm. diametro, rugosus, endocarpio osseo.

Tropical Africa. Gaboon: Munda; Sibange Farm, *Soyaux*, 263.

1174. **Peddiea cyathulata**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 251, anglice [Thymelaeaceae]; affinis *P. Zenkeri*, Gilg, a qua stylo quam ovario longiore differt.

Folia brevissime petiolata, versus apices ramorum plus minusve congesta, elliptica vel elliptico-lanceolata, acuminata, obtusa, 7·5–10 cm. longa, 1·8–2·5 cm. lata, subcoriacea, glabra; nervi laterales patuli vel ascendentes, multiramosi, sat distincti. *Umbella* terminalis, 2–5-flora, glabra; pedunculus 0·2–1·2 cm. longus; bracteae caducae, oblongae, 4–6 mm. longae, in marginibus minute pubescentes. *Flores* tetrameri; pedicelli 0·6–1·2 cm. longi. *Calycis tubus* 6–8 mm. longus, longitudinaliter costatus, glaber, costis prominentibus; lobi anthesi erecti, oblongi vel triangulares, apice rotundati vel truncati, in marginibus dense pubescentes. *Antherae* breves, lineari-ovatae. *Discus hypogynus* $\frac{1}{3}$ ovarii aequans, cupularis, non lobatus, margine crenulato villoso. *Fructus* non visus.

Tropical Africa. Nyasaland: Mount Malosa, 1200–1800 m., *Whyte*.

1175. **Thesium Dinteri**, *A. W. Hill* [Santalaceae]; species pedicellis elongatis distincta *T. mukensi*, A. W. Hill, similis.

Suffrutex 30–60 cm. alti; caules numerosi, erecti, ramosi, robusti; rami patento-erecti, laxi, 24–30 cm. longi, sulcati, quadrangulares. *Folia* distantia 0·4–1·2 cm. longa, linearia, apice acuto decolorato paullo reflexo. *Inflorescentiae* laxae, pauciflorae. *Flores* singuli, longe pedicellati, in axillis bractearum dispositi, pedicellis 0·6–1·5 cm. longis; bracteae foliosae, pedicellis ex parte adnatae, lineari-lanceolatae, acutae, carinatae, 6–8 mm. longae; bracteolae 2, 3 mm. longae, floribus breviores. *Perianthium* 3 mm. longum, siccitate aurantiacum, segmentis 0·75 mm. longis lanceolatis obtusis coriaceis dorso conspicue carinatis cucullatis apice longe barbatis. *Filamenta* 0·5 mm. longa; antherae 0·7 mm. longae. *Stylus* 1 mm. longus; stigmate capitato. *Fructus* immaturus.

Tropical Africa. German South West Africa: Hereroland; Okaruse Kalk, *Dinter*, 641; Kl. Huis, near Neitsas, *Dinter*, 784.

1176. **Thesium megalocarpum**, *A. W. Hill* [Santalaceae]; species fructibus grandibus distincta, *T. Goetzeano*, Engl., paullo similis, *T. longirostri*, Schlechter, foliis marginibus serrulatis affinis.

Suffrutex perennis; caules lignosi, erecti, 30 cm. vel plures longi, versus basin suberosi, superne sulcati, plus minusve quadrangulares, glabri, multiramosi; rami erecti, tenues, sulcati, foliosi, 10–25 cm. alti. *Folia* circiter 1 cm. longa, lineari-lanceolata, acuta, carinata, plus minusve erecta, marginibus minute serrulatis. *Inflorescentia* racemosa, laxa, floribus singulis stipitatis axillaribus vel breviter pedicellatis; bracteae 0·8–1 cm. longae, floribus longiores, pedicellis brevissimis adnatae, lineari-lanceolatae, acutae, acute carinatae, marginibus minute serrulatis; bracteolae 2, floribus paullo breviores. *Perianthium* 3 mm. longum, segmentis 1·25 mm. longis lanceolatis subacutis cucullatis apice et ad margines barbatis. *Filamenta* 0·3 mm. longa; antherae 0·5 mm. longae. *Stylus* crassus, 1·5 mm. longus. *Fructus* globoso-ovoideus, 4–4·5 mm. longus, 3–3·5 mm. latus, costis 10 et reticulationibus distinctis, stipite crasso 3 mm. longo instructus.

Tropical Africa. German South West Africa : Hereroland ; Waterbergplat, *Dinter*, 585 ; Otavi, *Dinter*, 726 ; Grootfontein, *Dinter*, 912.

1177. **Thesium xerophyticum**, *A. W. Hill*, [Santalaceae] ; species inter eas bibracteolatas foliis reductis, caulibus foliis et floribus pilosis distincta.

Suffrutex perennis ; caules lignosi, plus minusve erecti, 30 cm. vel plures longi, sulcati, minute pilosi, multiramosi : rami divaricati, 2–5 cm. longi, sulcati, minute pilosi. *Folia* numerosa, squamiformes, subulata vel late ovata, acuta, 1–2 mm. longa, apicibus fuscis. *Flores* sessiles in axillis bractearum dispositi ; bracteae triangulari-ovatae, acutae, 1·5 mm. longae, minute pilosae, bracteolae 2, concavae, ut bracteae apicibus fuscis. *Perianthium* 1 mm. longum, segmentis 0·5 mm. longis ovatis cucullatis extra hirsutis marginibus sinuoso-undulatis inflexis apicibus fuscis. *Filamenta* 0·4 mm. longa ; antherae 0·5 mm. longae. *Stylus* minutus. *Fructus* ovoideus, circiter 2·5 mm. longus, 2 mm. latus, minute pilosus, costis 10 conspicuis.

Tropical Africa. German South West Africa : Hereroland ; Windhoek, *Dinter*, 270 ; Farm Hoffnung, 1900 m., *Dinter*, 964.

1178. **Alchornea glabrata**, *Prain* [Euphorbiaceae-Crotoneae] ; species *A. floribundae*, Muell.-Arg., et *A. hirtellae*, Benth., valde affinis ab illa foliis minoribus ab hac capsulis haud verrucosis petiolisque haud hispidis differt.

Frutex vel interdum *arbor* 12 m. alta, ramulis minute pubescentibus vel puberulis. *Folia* breve petiolata, oblonga vel oblanceolato-oblonga, acuta, margine integra vel crenata, versus basin anguste truncatum vel cuneatum gradatim angustata, 10–15 cm. longa, 2·5–6 cm. lata, modice firma, utrinque glabra, nervis secundariis utrinque 6–8 subtus nervo centrali reticulationeque satis prominulis ; petioli puberuli vel glabri, 5–6 mm. long ; stipulae subulatae, 5–6 mm. longae. *Flores masculi* in spicas paniculatas terminales dispositi ; rhachis gracilis puberula vel fere glabra ; alabastra 1 mm. lata. *Flores feminei* in spicas simplices dispositi. *Capsula* 3-cocca, laevis, minute pubescens, 6 mm. diametro. *Styli* elongati, simplices.—*A. floribunda*, var. *glabrata*, Muell.-Arg. in Seem. Journ. Bot., 1864, p. 336, et in DC. Prodr. xv., pars 2, p. 905 ; Hiern Cat. Afr. Pl. Welw., pars iv., p. 976.

Tropical Africa. Nile Land : Juru, *Schweinfurth*, 3275. Angola : Pungo Andongo, *Welwitsch*, 352. German East Africa : Amani, *Zimmermann*, 93, 151, 880 : Usambara, 1200 m., *Buchwald*, 247 ; Lutindi, *Liebusch* ; Nquelo, 1000 m., *Scheffler*, 51 ; Kiriba Forest : North-East of Lake Tanganyika, 2100–2400 m., *Scott Elliot*, 8278, 8307 ; Rugege Forest, 1900 m., *Mildbraed*, 914 ; Kwidjivi Island in Lake Kiwa, 1600 m., *Mildbraed*, 1207.

Though referred by Mueller to *A. floribunda*, Muell. Arg., with which it agrees in having smooth fruits, it does not very strikingly resemble that species. It does, however, closely resemble and is evidently very nearly allied to *A. hirtella*, Benth., but differs in having smooth, not warted fruits, and is readily distinguished, in the absence of fruit, by the absence of hispid hairs on the mid-rib beneath and on the petioles.

1179. Cleidion Preussii, *Baker* [Euphorbiaceae-Crotoneae]; species *C. Mannii*, Baker, valde affinis floribus numerosioribus foliisque majoribus differt.

Frutex scandens, glabra. *Folia* distincte petiolata, ovata, 10–12 cm. longa, 5–6 cm. lata, acuminata, basi subrotundata, margine crenulata, membranacea, subnitida, utrinque glabra, 3-nervia, nervo centrali nervos secundarios arcuatos utrinque 2–3 emittentia; petioli glabri 4–5 cm. longi; stipulae minutae. *Racemi* masculi axillares breviter pedunculati, laxi, 10–15 cm. longi, ramulos breves patentes 2–4 mm. remotos 4–6 mm. longos plurifloros emittentes; pedicelli filiformes, flores excedentes; bracteae minutae, acutae, alabastra globosa, glabra, 1–5 mm. diametro. *Sepala* 3–5, glabra, subacuta. *Stamina* indefinita, filamentis brevibus receptaculo globoso insertis; antherae introrsae, 4-locellatae. *Flores* feminei ignoti.—*Mallotus Preussii*, Pax in Engl. Jahrb., xxiii., p. 525.

Tropical Africa. Cameroons: Barombi, *Preuss*, 420.

1180. Necepsia, *Prain*, gen. nov. [Euphorbiaceae-Crotoneae]; genus receptaculo masculo more plurium *Claoxylorum*, moreque *Argomuellerae* glanduligero, glandulis uti in illis piligeris sed densius, nec uti in hac nudis; a generibus ambobus forma insertioneque antherarum tamen distinctum.

Flores monoici, apetali. *Flores* ♂: *Calyx* ovoideo-globosus, segmentis 4 valvatis ascendentibus. *Stamina* numerosa; filamentis liberis receptaculo globoso tota superficie glandulis oblongis dense pilosis inter stamina sitis praedito inserta; antherae introrsae longitudinaliter connectivo latiusculo breviter ultra loculos producto affixae. *Ovarii rudimentum* 0. *Flores* ♀: *Sepala* 5, imbricata. *Discus* crassus, explanatus, margine minute crenulatus ibique glaber, superficie versus ovarium spectante quanta libera tanta setosa. *Ovarium* 3-loculare, dense setosum; styli 3, bifidi, crassi, subreflexi, basi brevissime connati, extra et prope basin intus pubescentes, superne intus prominenter fimbriato-papillosi; ovula in quoque loculo solitaria.—*Arbor*. *Folia* alterna, petiolata, minute remote dentata. *Flores* in spicis axillaribus androgynis vel 1-sexualibus dispositi; masculi plures femineo solitario centrali addito vel deficiente glomerati, vel feminei solitarii pluri-bracteati; bracteae rigidae, striatae, subscariosae.

N. Afzelii, *Prain* (species unica).

Arbor, innovationibus parce puberulis mox glabrescentibus. *Folia* breve petiolata, oblongo-ovata vel ovata, acute acuminata, apice mucronulata, minute remoteque dentata, basi late cuneata ibique subtus prope apicem petioli 2-glandulosa; 10–25 cm. longa, 6·5–9 cm. lata; utrinque glabra, siccitate brunnescentia; nervi laterales utrinque 7–8, ascendentes, nervuli subparalleles, ambobus nervoque centrali subtus prominentibus, nervis centrali lateralibusque etiam supra prominulis; petiolus 1–2·5 cm. longus, supra canaliculatus, glaber; stipulae lanceolatae, rigidae, subscariosae, persistentes, 6 mm. longae. *Spicae* solitariae, axillares, 10–25 cm. longae; rhachis angulata, rigida, fusco-puberula; bracteae glomeratae, dense imbricatae, ovatae, acutae, rigidae, striatae, subscariosae, pubescentes, 2–4 mm. longae; glomeruli flores masculos plures femineo singulo centrali addito, nunc flores masculos plures tantum, nunc florem singulum

femineum includentes. ♂ *Alabastra* ovata, demum ovoideo-globosa subacuta. *Calycis* segmenta 4, valvata, extra puberula ; pedicelli puberuli, 2 mm. longi. *Petala* 0. *Stamina* circa 30 ; filamenta libera receptaculo subgloboso affixa glandulis oblongis dense pubescentibus intermixta ; antherae introrsae, 2-loculares ; loculi ovati connectivo latiusculo breviter producto parum sejuncti. ♀ *Alabastra* globosa. *Sepala* 5, triangularia ovatave, acuta, puberula, imbricata. *Discus* crassus, explanatus, margine crenulato glaber, supra ubi ab ovario liber dense setosus. *Ovarium* 3-loculare, dense fusco-setosum, loculis 1-ovulatis ; styli basi minopere connati, subreflexi, 2-fidi, extra fusco-pubescentes ; intus versus basin pubescentes superne stigmatici, fimbriato-papillosi.

Tropical Africa. Sierra Leone, *Afzelius*, 29 ; Cameroons : Bipinde, *Zenker*, 3040.

L.—AGAVE LURIDA.

J. R. Drummond.

One of the most interesting of the *Agaveae* that have flowered at Kew during this year and the last is the tall *Euagave* that "poled" in the Succulent House in the past summer, which is a good example of the species described by W. Aiton in the first edition of the Hortus Kewensis, vol. i., p. 472 (1789), as variety 'beta' of his *A. lurida*. For his 'alpha' variety, which differed from 'beta' by the proportionately greater breadth of its leaf, he cited Philip Miller's *A. Vera-Cruz*, which was correct—while for 'beta' he gave a double synonym, viz., "*A. rigida*, Mill. Dict.," and again, "Mill. Dict. edit. i. Aloe 4," the latter being pretty certainly right. The identification with the *A. rigida* of the Gardeners' Dictionary, on the other hand, presents serious difficulties. Tradition early pointed to the species which has just flowered at Kew as Miller's *rigida*, but this cannot be reconciled with Miller's own very clear description of the leaves as "entire," that is, presumably, without indentation or prickles. Again, "*A. rigida*" is often applied, following a guess of Engelmann's, to one or more of the plants from which the "Sisal hemp" of commerce purports to be derived, and in a recent publication (Miss. Bot. Gard. Rep., xix., pp. 273–287) Dr. Trelease has put forward a very able and elaborate plea in support of this usage ; but the present writer cannot escape the circumstance—first pointed out by Col. Prain—that at all events the "Bahama Hemp" (*A. sisalana*, Perrine), cannot possibly be identified with Miller's *rigida*, of which he wrote, "*this sort never puts out suckers from the root, nor have I seen any plant of this kind in flower, although there are many of them in the English Gardens, some of which are of considerable age.*" Now the "Bahama Hemp" (*A. sisalana*, Perrine), sends up suckers freely and continuously, while the chief plantation Agave of Yucatan is ordinarily propagated in the same way as Perrine's species ; the planter's object being to keep his plant from "poling" as long as he can, he naturally cultivates those kinds that yield offsets freely.

When Dr. Trelease's memoir was written, as well as that on the Furcraeas, by the present writer in the eighteenth Report of the Missouri Botanical Garden (1907, pp. 25–75), an essential key to the earlier history of this group of Euagaves was wanting, which has been in great part supplied by the flowering of *A. lurida*, and the remarks at p. 61 of the *Furcraea* article, so far as they suggest that the "*A. mexicana*" of Desfontaines' may have been identical with the *A. Vera-Cruz* of Miller, must now be modified, if, as is probable, Desfontaines' "*mexicana*" was the plant still cultivated under this name in Portugal and Italy, because there is good herbarium material at Kew which proves that the "*A. mexicana*" grown in the Coimbra Garden, as well as that which flowered in Baron Ricasoli's experimental garden in Tuscany in 1882 (see Gard. Chron. n.s. xix. [1883] p. 142, fig. 22), belonged to the same species as the plant received from Messrs. Sander as "*A. mexicana*," which has lately flowered at Kew, and is, without question, that depicted at t. 1522 of the Botanical Magazine (1813) as one variety of Aiton's "*lurida*." We can now follow with some confidence the steps in the introduction of these large Euagaves into European countries. The first to arrive, and the only one that seems to have established itself on any scale as a denizen of Europe, is the species often, if not usually, called "*A. americana*" in Southern Europe, but properly styled *A. Vera-Cruz*, Ph. Miller (Gard. Dict. ed. viii.). This is at home in parts of Asia and Africa as well, and has been worked up for its fibre, which is far from the best of its class, by market report, and is chiefly used, probably—like that of *A. Cantala* in India for example—as an admixture with superior staples such as *A. sisalana* or certain Furcraeas. This was "Aloe 4" of the 1st edition of the Gardeners' Dictionary, and, as *A. Vera-Cruz* of Miller, is duly cited for the broad-leaved form of his own *A. lurida* by Aiton, who, had he followed his own judgment, would most likely not have placed it under the same species as his true *lurida*. The differences between the two forms are both striking and essential, but depend on features which the Linnaean canons led contemporary students to regard as inadequate for specific diagnosis. To anyone who has seen *A. Vera-Cruz* poling in the open there can be no difficulty in distinguishing *A. lurida*, though the general plan of the inflorescence—the very long filaments forming a sort of tuft or plume above the germen—and other characters are almost identical; the remarkable green perianth of *lurida*, however, marks it off immediately. The best means of distinction is to be found, as the Hortus Kewensis has indicated, in the outline and proportional dimensions of the leaf: in *A. Vera-Cruz* the blade is broader in proportion to the 'neck' than in *A. lurida*, and it must be remembered that although, in all the *Agaveae*, surrounding conditions, more particularly if induced by cultivation, do undoubtedly affect the absolute size and development of the vegetative organs—yet the proportions of the leaf, also the plan of the inflorescence, and the relative features of the floral parts are found, from study, to be very constant.

The prickles on the margin of the leaf in *A. lurida* are almost garnet-coloured when young, turning deep chestnut in age; in *A. Vera-Cruz* they are chestnut when young, turning when old a

deep shiny black, as duly noted by Philip Miller; further, in *A. lurida* they are about half the size of the side prickles of *A. Vera-Cruz* if compared at the same stage of development.

The next species that was brought to Europe seems to have been the true *A. americana* of Linné (Sp. Pl., ed. i., vol. i., p. 323), which is figured in Andrews' Repository, vii., t. 433 (numbered by an error "438"). In Bot. Mag., t. 3654, there is a good representation of the variegated form of this species which is that most commonly in cultivation. This is a hardier kind than *A. Vera-Cruz*, though specimens of both, and of yet another species, live through the summer outside the Temperate House at Kew; *A. americana* has flowered in the open as far north as Aberdeenshire and in Sweden. In the south of England it is nearly if not quite hardy. *A. lurida* on the contrary seems not to endure the climate of any part of these islands.

The third species just mentioned is perhaps the comparatively rare *Euagave* described by Miller at p. 148 of his "*Figures*" (and depicted in plate ccxxii.), which was possibly the "*A. Virginia*" of the 8th edition of the Gardeners' Dictionary, and is certainly *A. Milleri* of Haworth (Synopsis, p. 71). This is very easily mistaken, when not flowering, for *A. americana*, but the comparatively narrow end-spine marks it sufficiently; the leaf moreover has a different tint from that of *A. americana*.

The native homes of *A. americana*, *A. Milleri* and *A. lurida* are quite unknown; that of *A. Vera-Cruz* is probably to be sought on the eastern scarp of Central America. It seems not impossible that it may be the *Zapupe silvestre* of the tract between Vera-Cruz and Tampico (see Trelease, in Trans. Ac. St. Louis, xviii., p. 34, under *A. aboriginum*). Another species, which was early brought to Holland from the West Indies and well known to botanists and horticulturists of the 17th and 18th centuries as "*Aloe sobolifera*," was for a long time lost to science, but it is very probably the common species of Jamaica brought to notice by Sir Daniel Morris, and now represented in the Succulent House at Kew under the name of *A. Morrisii*, doubtfully distinct from the *A. Antillarum* of Descourtilz (Fl. Ant., iv. p. 239, t. 284). This species belongs to a group readily distinguished by the bright yellow colour of the blossoms; the leaves of *A. Morrisii* have a different consistency from those of the *americana* group, while the side prickles are comparatively minute and set far more closely.

It should here be noted perhaps that the real *A. americana* has no merits whatever except horticulturally. Its fibre is wretched; its juice does *not* form a substitute for soap, and it is emphatically *not* the plant from which the "Pulque" of Central America is extracted. A fine example of one of the chief Pulque-producing species is to be seen near the west entrance of the Succulent House at Kew, labelled *A. atrovirens*; it has recently transpired that this may not be true *atrovirens* of Karwinski, and it should perhaps be named *A. cochlearis*, Jacobi.

The true *lurida* of Aiton (as distinguished from the *Vera-Cruz* of Miller, which he was unfortunately led to bracket with it as a "variety" of one species) seems to flower less readily than any of

its allies in European collections. The writer has been able to authenticate only the following :—

(i.) 1811, Royal Gardens, Kew ; see Bot. Mag., t. 1522 :

(ii.) 1881 (January), Coimbra Gardens, Portugal ; see specimens, drawing, and note, communicated by Dr. Henriques, in Herb. Kew :

(iii.) 1882, Experimental Garden, Port Ercole, Argentario Promontory, Tuscany ; see specimens communicated by Baron Ricasoli in Herb. Kew, also his note in Gard. Chron., n.s. xix. (1883), p. 142, fig. 22.

The plant which flowered with Saunders about 1873 (see *Refugium*, t. 307) does not seem from Mr. Baker's description to have been Aiton's *lurida*. It was more probably *A. Jacquiniana*, Hook. (in Bot. Mag., t. 5097). In the Herbarium of the British Museum there is a sheet with three flowers on it which are referable perhaps to *A. lurida*, and on this is a note by one of Banks' staff that the specimens came from Ball's Pond (near Stoke Newington), and this would not improbably indicate an even earlier example than that at Kew of 1811. But on the same sheet there are other fragments that seem to belong to a different species, and besides this there exists yet another *Agave* which, though otherwise conspicuously distinct, has a perianth rather nearly resembling that of the true *lurida*. This species has indeed been taken for "*A. lurida*, var. *Jacquiniana*" (i.e., *A. Jacquiniana*, Schultes ex Hooker), but is probably = *A. miradorensis* of Jacobi in Abh. Schles. Ges., 1869, p. 156, which again it is difficult to separate by the description from the earlier *A. Desmettiana* of the same author (Versuch., p. 241).

A drawing was made from the living specimen of 1811 by a contemporary artist, who for some inscrutable reason drew the leaf tip as if it had no terminal spine, and this error, together with the peculiar colouring, has attached a shade of doubt to the illustration, which has now been dispelled by the flowering of the modern example, for the inflorescence proves to have been faithfully depicted. About two years later this drawing was submitted to Gawler, who learned from the younger Aiton that it was the *A. lurida* of his father and predecessor. Unluckily Gawler did not grasp the essential circumstance that Aiton's *lurida* was horticulturally and, as it now proves, correctly limited to the so-called variety ('beta') of the 1st edition of the Hortus Kewensis, the ('alpha') variety being Miller's *A. Vera-Cruz*, with which as Miller's pupil he was doubtless thoroughly acquainted. As a consequence, while Gawler was at due pains to correct a mistake which had been copied from Willdenow (Sp. Plant., ii. p. 193) into the 2nd edition of the Hortus Kewensis, namely the identification of *A. lurida* of Aiton with the *A. lurida* of Jacquin (Collect., iv. p. 94, t. 1, publ. 1790), he opened the door for a fresh troop of errors by identifying the plant of the Botanical Magazine figure with the 'alpha' variety of the elder Aiton, which, as we now clearly understand, is the quite distinct, though closely allied species, *A. Vera-Cruz* of Philip Miller. In the 19th Report of the Missouri Botanical Garden (pp. 279–287), Trelease has cleared up the

history of the *A. lurida* of Jacquin, and there can be no doubt, in view of the facts and arguments he has there marshalled, that Jacquin's plant was the same as that widely naturalized in the East Indies, for which the name of *A. Wightii* was proposed in Bengal Agricultural Bulletin, No. 8, 1905, by Col. Prain and the writer, and also with the *A. Jacquiniana* of Sir William Hooker in Bot. Mag., t. 5097 (1859).

Dr. Trelease carries his revision a step farther, and refers this well-marked species to the *A. angustifolia* of Haworth (Syn. 72); but for reasons that need not be detailed on this occasion the writer recommends that Jacquin's misnomer for this "Bastard Aloe" ("*A. vivipara*" of several authors) be replaced by the title of *A. Jacquiniana*, Schultes ex Hooker in Bot. Mag., t. 5097 (1859). The full description of *A. lurida*, Aiton, is held over till the plant, as it is hoped it will, may ripen capsules; the detailed synonymy of course awaits the description. It should be explained, however, why the use of *A. mexicana* for *A. lurida*, 'beta,' of Aiton is not here adopted in spite of its evidently general acceptance on the Continent of Europe. The original *A. mexicana* of Poiret, Suppl. i. p. 241 (1810), in so far as it was anything, related not to any Agave at all, but to *Furcraea cubensis*, Ventenat (see Miss. Bot. Gard. Rep., xviii., pp. 61–62, also earlier remarks by Fürst zu Salm. Dyck in Bonplandia, 1859, p. 88). It is now impossible to say what the original *A. mexicana* of the Jardin du Roi actually was, though it was most likely either *A. Vera-Cruz*, Miller, or *A. lurida* of Aiton (i.e., the true 'beta,' not the 'alpha' variety). Haworth's description of *A. mexicana* (Suppl. 41), inadequate as it may be, probably refers to the same species as Aiton's *lurida* ('beta'), but unless we are to throw over *lurida* altogether, Aiton's name has priority, for the Supplement appeared more than 20 years after the first edition of the Hortus Kewensis.

A key to the identification of the chief species mentioned in this note is appended.

Key.

Leaf-margin without prickles, finely serrulate... *miradorensis*, Jacobi
Leaf-margin furnished with prickles—
  Prickles inconspicuous; perianth bright yellow... *Morrisii*, Baker
  Prickles conspicuous; perianth green, or tinged with dull yellow—
    Leaves in a dense globose rosette, never exceeding 3 feet in length ... ... *Jacquiniana*, Schultes ex Hooker
    Leaves in a lax rosette, or tufted, always when mature exceeding 3 feet in length—
      Leaves hardly widened at the middle, very narrow in proportion to their length ... ... *Cantala*, Roxb.
      Leaves obviously widened at the middle—
        Leaves ascending sharply from their bases; perianth-lobes narrowly ligulate, more or less constricted below their tips—
          Trunk inconspicuous; leaves tufted ... *sisalana*, Perrine
          Trunk ultimately attaining 5 feet in length; leaves arranged in a spiral rosette ... *longifolia*, Engelmann

Leaves decurved, or spreading at their bases; perianth-lobes ovate lanceolate, not constricted below their tips—

Leaves concave upwards, very fleshy up to their apical third ... ... *cochlearis*, Jacobi

Leaves not concave or fleshy in their apical third—

Leaves oblong-lanceolate in outline, neck manifestly constricted—

Terminal spine stout, markedly decurrent; leaves dull green (or striped with yellow) *americana*, Linn.

Terminal spine comparatively slender, hardly decurrent; leaves a brighter green *Milleri*, Haworth

Leaves oblong-linear in outline, hardly constricted at the neck—

Perianth lobes pale amber-coloured upwards; leaf tips ultimately revolute... *Vera-Cruz*, Ph. Miller

Perianth lobes green throughout; leaf tips erect, rigid ... ... *lurida*, Aiton

LI.—MISCELLANEOUS NOTES.

Mr. W. J. Tutcher, whose appointment as Assistant Superintendent in the Botanic and Forestry Department, Hong Kong, was recorded in *K.B.* 1891, p. 245, has been appointed Superintendent of the Department in succession to Mr. S. T. Dunn, resigned.

Dr. Melchior Treub.—The death of this distinguished botanist, which took place at Saint Raphaël, near Cannes, on October 3, 1910, deprives Kew of a warm and constant friend.

Treub was born at Voorschoten, in Holland, on December 26, 1851. He entered the University of Leiden in 1869 and became assistant in the Botanical Institute there in 1874. In November, 1880, on the death of Dr. R. H. C. C. Scheffer, he was appointed Director of the Botanic Garden at Buitenzorg, in Java. During his tenure of this important post Treub was able to do much to increase its reputation and enhance its value. When he arrived in Java he found a well-furnished garden at Buitenzorg itself with a herbarium attached dating from the commencement of the establishment, and an annexe in the shape of a mountain garden at Tjiboddas established under the directorship of Teijsmann; also a museum and an experimental station organised by his immediate predecessor. To these he was soon able to add a series of well equipped laboratories for the prosecution of pharmacological, chemical, and physiological research, and to provide a special laboratory reserved for the use of foreign botanical investigators.

Under his guidance Buitenzorg soon became the leading centre of research connected with tropical agriculture, and the chief value of the help he has thus been able to afford to agricultural and other

cognate practical studies has been due to the fact that the results obtained by those working under him have depended directly on scientific investigation. The mass of administrative work involved in the supervision of so many and such varied activities, in place of impeding, appeared only to whet his own interest in scientific botanical studies, the results of which found a medium for publication in the Annals of the Buitenzorg Garden founded by Scheffer, and edited, from the second volume onwards, by Treub.

These studies have been of the most varied character and have been marked by the same wide interest that is reflected in his administrative work and in the practical investigations entrusted to his officers. His papers on morphological, embryological, physiological and phytogeographical subjects are characterised by a soundness of judgment and by a lucidity of treatment and perfection of style which fix the attention of the reader. He has touched on no subject which he has not illuminated, and his place as an investigator and expositor will be hard to fill. The value of his contributions to natural knowledge was very generally recognised; he was a corresponding member of the French and of the Bavarian Academies, and a foreign member of the Royal and Linnean Societies of London, and the recipient in 1907 of the Linnean Medal of the last-named body.

Towards the end of his career in Java his work of organization was crowned by the establishment in that island of a scientific Department of Agriculture, whereof the establishment at Buitenzorg forms an integral part, of which Treub was appointed the chief. While prosecuting the preliminary enquiries necessary in connection with this important change, Treub paid a visit to Manila where he contracted an illness the effects of which he did not speedily shake off. Shortly after his return to Buitenzorg he was compelled to take a somewhat prolonged leave of absence, which he spent in the mountains of Java. His health became sufficiently restored to admit of his resuming his duties, but about a year ago it again became so indifferent as to necessitate his resignation of office. He had intended to settle on the Riviera, but the state of his health necessitated his wintering in Egypt, and he did not reach Saint Raphaël, where he died, until spring.

Dr. Theodore Cooke.—A warm friend of Kew and one who had gained the sincere regard and affection of the members of the staff of the institution, has been lost to us in the person of Dr. Theodore Cooke, whose death occurred at his residence, Portswood House, Kew Gardens Road, on Saturday, November 5, 1910.

Dr. Cooke, who was in his 75th year, was born at Tramore, Co. Waterford, in 1836. He was the eldest son of the Rev. J. Cooke, M.A., formerly rector of Ardfinan, Co. Tipperary. Entering Trinity College, Dublin, he graduated in 1859, being Hebrew Prizeman, first Honoursman, and Senior Moderator and Gold Medallist in Experimental and Natural Sciences in the University, and obtaining special certificates in Mechanics and Experimental Physics, Chemistry, Mineralogy, Mining and Geology in the Engineering School. Destined originally for the profession of civil

engineer, Cooke went to India in 1860 as an engineer in the service of the Bombay, Baroda and Central India Railway, then under construction ; while in the service of this corporation he had charge of the building of the great iron bridge at Bassein, over 4000 feet long, which carries the line northwards to Surat. The work of the talented and versatile young engineer attracted the attention of Government, and in 1865 he was chosen to fill the important post of Principal of the Civil Engineering College at Poona. This college, with widened scope, developed into the Poona College of Science, and the principalship was held by Cooke with all the success that his wide and varied knowledge, his unvarying tact, and his administrative skill had led Government to anticipate until he retired from India in 1893. His knowledge and experience were during the 28 years of his tenure of this post utilised by Government in other directions ; on three occasions he was appointed to act as Director of Public Instruction, on another he acted as Director of Land Records and Agriculture in the Presidency. He was also appointed by Government a Fellow of the University of Bombay, in whose fortunes he took a keen interest, serving for a time as Dean of Faculty and as a member of the Syndicate. Throughout his service in India Cooke was keenly interested in botanical studies and one of his chief recreations was botanical field work. To this occupation of his leisure hours he brought the thoroughness and care which characterised the performance of his official duties, so that he became in time a recognised authority on critical points connected with the identity and distribution of the plants of the Bombay Presidency and Scinde ; it was therefore a particularly appropriate recognition of this fact that, in 1891, when the Botanical Survey of India was created by the linking up of the various botanical officers in the empire, the Bombay Government, who had no official botanist on their establishment, should have entrusted to Cooke's charge botanical survey operations in Western India. Shortly after his assumption of this duty, Cooke submitted a proposal which received the cordial support of the late Sir George King, then Director of the Survey, to undertake the preparation of a local *Flora of the Presidency of Bombay*. This proposal failed at the time to meet the approval of the Secretary of State for India, and when Cooke left India in 1893 his energies found an outlet in an appointment he was asked to accept at the Imperial Institute. After filling this post for three years he left London and settled in the West of England. The desire to prepare a Bombay Flora, though deferred had not, however, been abandoned, and in 1898, Cooke resubmitted the original proposal which on this occasion met with the approval of the Secretary of State. When Cooke assumed charge of the Botanical Survey of Western India in 1891, he placed a moiety of his magnificent private collection in the Herbarium of the College of Science at Poona, retaining the other moiety as a working set to be used in the preparation of the Flora. This personal set he took with him to England, and when his employment as author of the Flora was sanctioned he brought his specimens with him to Kew, where he took up permanent residence in order that he might carry out the work in the Herbarium there.

Once begun, the work, which in its complete form consists of two volumes containing eight parts, proceeded without a break. The first part was published in 1901, the eighth and concluding part appeared in 1908. Cooke applied to the task of its preparation all the precision and method characteristic of his official work. Every previous statement was subjected by him to careful personal verification ; the descriptions and the keys provided are models of lucidity and conciseness, and the work, which is a safe guide to the identity of the plants of the area with which it deals, has ensured for Cooke an honoured place in the roll of Indian botanists. While the work was in progress a serious fire completely destroyed the Poona Herbarium, and, with much public spirit, Cooke, as he completed the various parts of his *Flora*, despatched to India the material on which he had worked to replace the moiety of his collection which had been lost through this fire. When the Bombay Flora was finished Cooke lent his services as a volunteer to the task of assisting Sir W. T. Thiselton-Dyer in the preparation of the great *Flora Capensis*. He was engaged in this when overtaken by the illness whose fatal termination we now deplore.

A man of wide interests and of varied and accurate information, Cooke nevertheless did not allow himself to deviate from the work which he, for the time being, had in hand. To this capacity for steady application to the business immediately before him his success in all that he undertook was very largely due. An M.A. and a Master of Engineering of his University in ordinary course, his attainments were further recognised by his alma mater by the conferment of the degree of LL.D. ; his administrative gifts were recognised by Government in 1891 when he was created a C.I.E. A member of the Institute of Civil Engineers, Ireland, he was also a member of the Anthropological Institute of Great Britain and a Fellow of the Geological and the Linnean Societies.

Eucryphia pinnatifolia, *Gay*.—Among the hardier small trees and shrubs from South America this is decidedly one of the most attractive, yet it still remains, although introduced about 1862, one of the rarest in gardens. For this scarcity one must find some other cause than lack of hardiness, for the original tree in the Coombe Wood Nursery has withstood uninjured the frosts of over 40 years, including those of February, 1895. For several years there was a group of plants in a bed on the lawn near the Cactus House at Kew which grew and flowered well until they were 4 or 5 feet high ; they then commenced to die off one by one for no perceptible reason until none remained. Others planted in the collection of Rosaceae near the Pagoda behaved in a similar way. It was thought that their early death might be due to intense summer heat and dryness, which appear to have a peculiarly burning effect on much of the outdoor exotic vegetation at Kew, especially that from regions where the climatic conditions are moist and equable. To counteract this in the case of the Eucryphia, several plants were put out in a mass of *Erica mediterranea*, where the heaths grow close enough together to shade the soil and keep it permanently cool. In this position not one of the Eucryphias has

died, and the largest of them are now 8 feet high and in perfect health. Several flowered profusely last July and August—a season of blossoming which adds much to the garden value of any shrub, especially one whose beauty is as marked as that of this *Eucryphia*. The soil is the ordinary sandy loam of Kew to which peat and decayed leaves have been added. W. J. B.

Presentations to Museums.—The following miscellaneous specimens have recently been received :—

Mr. John Christie, of Messrs. Ide and Christie, Mark Lane, E.C. —Portions of plant of *Posidonia australis*, photo-micrographs of fibre obtained from same, also three photo-micrographs of infusorial earth and of a transverse section of a leaf of *Posidonia Caulinii*.

Bull Wharf, Ltd., Queenhithe, London, E.C.—A series of views illustrating the rubber industry in this country.

Sir Thomas H. Elliott, K.C.B.—Series of models of agricultural implements used in Japan.

Mr. P. G. Chapman, London Road, Kingston-on-Thames.—Seven tobacco pipes, including two from Uganda, and a series of views to illustrate the preparation of plug tobacco, by sailors.

Messrs. Bult Bros., Billiter Street, London, E.C.—Implements used in the collection of rubber.

Messrs. Stafford Allen & Sons, Ltd.—A collection of drugs prepared from home-grown plants and a series of photographs illustrating the cultivation of medicinal and perfume plants on their farms at Long Melford, Suffolk.

Provincial Forest Officer, Oloke Meji, Southern Nigeria.—Roots of "Ahun" or "Awan" (*Alstonia congensis*) and of "Aforo-Afe" (*Trema africana*). Fruits of "Egusi-Bara" (*Citrullus vulgaris*) and of "Egusi-Ito" (*Adenopus breviflorus*) ; the seeds yielded by these fruits are employed as food by the natives.

Director of Agriculture, Aburi, Gold Coast.—Photographic views of the agricultural stations and rubber plantations at Aburi and Tarquah.

Director, Royal Botanic Gardens, Kew.—Saki cup of Japan lacquer.

Assistant Director, Royal Botanic Gardens, Kew.—Series of photographs taken by the donor during a recent tour in Algeria and Morocco.

Mr. Reginald Tower, C.V.O., British Legation, Mexico.—A quantity of the wood of Lignum nephriticum (*Eysenhardtia amorphoides*) ; also pods of "Cascalote," apparently identical with "Divi Divi" (*Caesalpinia coriaria*), a well-known tanning material.

Superintendent of Forests, Entebbe, Uganda.—Two pieces of the wood of *Balanites Wilsoniana*, collected by the donor in the Bodongo Forest.

Mr. Anthony Waterer, Knaphill Nursery, Woking.—Two sections of the trunk of *Fagus betuloides*.

Right Honourable the Earl of Yarborough, Brocklesby Park, Lincolnshire.—A valuable collection consisting of 79 planks of home-grown timber.

Right Honourable the Earl of Derby, Knowsley, Prescot.—Planks of alder, willow, poplar, sycamore, section of stem of *Rhododendron ponticum*, and two sections of a burr of Turkey oak.

Right Honourable the Earl Beauchamp, Madresfield Court, Malvern.—Ten planks of various timbers, including *Sequoia gigantea*, *Taxus baccata*, *Cupressus Lawsoniana*, together with abnormal growths of larch, Scots pine, hazel, blackthorn, oak, lime, and maple.

Sir Edmund Loder, Bart., Leonardslee, Horsham.—Trunk of a diseased larch.

The Stanley Underwood Co., Lynchmere Farm, Haslemere.—Specimens to illustrate the application of the timber of sweet chestnut for fencing.

Messrs. William Hunt & Sons, The Brades Ltd., Brades Steel Works, near Birmingham.—A collection of tools connected with forestry operations.

J. M. H.

Botanical Magazine for November.—The plants figured are *Xeronema Moorii*, Brongn. et Gris (t. 8342) ; *Pleiocarpa mutica*, Benth. (t. 8343) ; *Columnea Oerstediana*, Klotzsch ex Oerst. (t. 8344) ; *Pyracantha angustifolia*, C. K. Schneider (t. 8345) ; *Houlletia Sanderi*, Rolfe (t. 8346).

The *Xeronema* is a striking plant from the mountains of New Caledonia at elevations of from 3000–5000 feet. It was introduced to European cultivation as long ago as 1875 by Mr. J. Linden, but the subject of the illustration was acquired for Kew in 1896 from Messrs. J. Veitch & Sons. *Pleiocarpa mutica* is a beautiful white-flowered stove shrub of this endemic Tropical African genus. This species was discovered by Mr. G. Mann in the Cameroons, and has since been found in Calabar. It is a somewhat aberrant member of the *Apocynaceae* and also of the genus in possessing five carpels—a peculiarity it shares with *P. rostrata*, Benth. The other species of the genus, excepting *P. salicifolia*, Stapf, with three or four carpels, have only the two carpels characteristic of the order. The Kew plant was raised from a cutting received in 1902 from the Glasgow Botanic Garden. The *Columnea* was discovered in Costa Rica 50 years ago, and does not appear to have been collected since then. The plant illustrated flowered in February last in the collection of Col. R. H. Beddome, Sispara, West Hill, Putney. Owing to the pendent habit of the branches and the bright scarlet flowers, this species forms an effective basket plant and bears considerable resemblance to some of the tropical species of *Aeschynanthus*. The Chinese thorn, *Pyracantha angustifolia*, discovered by Delavay in Yunnan in 1882, has afforded an opportunity of settling the vexed question of the taxonomy of the Chinese, European everlasting, and white thorn of Nepal. The everlasting thorn, or Buisson Ardent, is now universally known as Pyracantha, and it is fortunate that it has been found possible to maintain *Pyracantha* as the generic name for these three thorns. *P. angustifolia* was introduced to cultivation by Soulié, who sent seeds to Mr. M. L. de Vilmorin from

Eastern Tibet in 1895, and in 1899 seeds were sent to Kew by Lieut. Jones from Western China. The plant is not perfectly hardy at Kew, but flourishes in the warmer parts of England, and the subject of the illustration was received from Lieut.-Col. D. D. Cunningham, Tormount, Torquay, in whose garden the berries develop their beautiful orange colour. *Houlletia Sanderi* is the fourth species of the genus to be figured in the Magazine. This species was imported from Peru by Messrs. Sander & Sons, St. Albans, and the specimen figured was the first to flower in Europe, material being sent from the nursery of Messrs. Sander & Sons at Bruges. *H. Sanderi* is most nearly allied to *H. Lowiana*, Reichb. f., from Colombia.

Sugar Cane Wax.—We are indebted to Professor G. Barger, Professor of Chemistry at the East London College, for the following review of Mr. A. Wijnberg's recent book in Dutch on "The Wax of the Sugar-cane, and the Possibility of its Technical Production," * which has been presented to Kew by Professor G. van Iterson, of Delft.

The book under review is a dissertation from the newly founded botanical laboratory (Prof. G. van Iterson) of the Technical High School at Delft, and deals in an exhaustive manner with the possibility of commercially utilizing the wax-coating of the sugar cane. In addition there is an account of the chemistry and biological significance of vegetable waxes in general.

The botanical part of the investigation completely confirmed the results of De Bary's investigations; the origin and structure of the wax coating is illustrated by drawings of microscopical preparations.

Chemically the wax of the sugar-cane was examined as long ago as 1840 by Avequin (*Ann. Chim. Phys.*, [ii.], vol. 75, p. 28), and an analysis of it was made by the celebrated chemist Dumas. The material for this examination was obtained by carefully scraping the outside of the cane, a process which is of course not applicable on a large scale. The author of the present treatise has therefore used another method, starting from the so-called "filter dirt," a waste product of the Java sugar industry. When the cane is crushed, and subsequently extracted with hot water, nearly all the epidermal wax passes into the crude juice, where it remains suspended, until the juice is purified by the addition of lime and subsequent boiling, when the wax is carried down in the precipitate formed. Thus on filtration the wax is found in the so-called "filter dirt" which remains in the filter press, and which may contain 10 per cent. or more of wax.

By extracting fresh filter dirt with ligroine (light petroleum) a complicated mixture is obtained, consisting mostly of fats (glycerides of oleic and linolic acids), and about 30 per cent. of wax. If the filter dirt has fermented for some time, the fats have disappeared and the ligroine extract consists mostly of the wax, which is more resistant to bacterial action. The wax may be separated from fats

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* "The Wax of the Sugar-cane, and the Possibility of its Technical Production.' By A. Wijnberg, Amsterdam, 1909, pp. 198, with 2 figures and five plates.

by crystallisation from ligroine, in which it is less soluble; it then consists chiefly of myricyl alcohol and a substance of the formula, $C_{33}H_{68}O$.

The crude cane wax, thus obtained, melts above 80° and is still dark coloured. It may be bleached by means of chlorine, when it is, however, attacked to some extent. The colouring matter may also be removed by adding fuller's earth or a similar substance to the melted or dissolved wax, and allowing to settle. The product, refined by this mechanical process, closely resembles the valuable Carnauba wax, obtained from the Brazilian Palm *Copernicia cerifera*. It would appear that the latter wax can be replaced in most cases by cane wax, so that there ought to be a market for the latter article. The author advises sugar works to keep their filter dirt and let it ferment, with a view to ultimate extraction. The extraction of the crude material is being started in Java, where, it is calculated, more than 4000 tons of wax should annually be obtainable. At present, it is impossible to estimate the commercial value of cane wax with any degree of accuracy. Since it is much harder than beeswax, and closely resembles Carnauba wax, it is thought that it might be almost as valuable as the latter article, which is worth at least 11*d.* per lb. The author estimates the cost of producing refined cane wax on the large scale at 2*d.*–3*d.* per lb.

In the development of a chemical industry the utilisation of waste products is often of great importance; whether the wax of the sugar cane can be utilised technically remains to be seen, but in any case Mr. Wijnberg's book is a most important contribution towards the solution of the problem.

Flowers out of Season.—Although mild, the past autumn was not exceptionally so; several recent autumns have at any rate surpassed it in this respect. Yet an unprecedented number of shrubs which flower normally in spring were more or less in blossom in October. These unseasonable flowers open poorly, or often get scarcely beyond the bud state. Some, like the varieties of common lilac, have pushed many young inflorescences just beyond the protecting winter scales, and they are thus left exposed to the inclemencies of the winter.

On October 21st, 1910, the following shrubs were noted with fully open flowers; some, like the Laburnum, with entire inflorescences; they were all from three to seven months before their proper season:—Berberis Gagnepainii, Ceanothus thyrsiflorus, Deutzia setchuenensis, Erica hybrida and E. lusitanica, Escallonia Philippiana, Forsythia suspensa, Fothergilla major, Genista virgata, Glastonbury Thorn, Hamamelis arborea and H. Zuccariniana, Laburnum alpinum, Spiraea bracteata, S. Thunbergi and S. Van Houttei, Syringa villosa, Viburnum Tinus, V. rhytidophyllum, V. utile. As might be expected, a good number of late summer or autumn-flowering shrubs still remained in bloom.

W. J. B.